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Agricultural Economics RESEARCH

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UNITED STATES DEPARTMENT OF AGRICULTURE • Economic Research Service

Contributors

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AGRICULTURAL ECONOMICS RESEARCH

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The Role of Economics and Statistics in the USDA

By Willard W. Cochrane

The first issue of Agricultural Economics Research *appeared in January 1949. The original purpose of the new journal was to provide the Bureau of Agricultural Economics with a "medium for the publication of technical articles." Following the abolition of the Bureau in late 1953, the journal continued to be issued—first under the sponsorship of the Agricultural Marketing Service, and later under the joint sponsorship of that agency and the Agricultural Research Service. In April of this year, the economic and statistical work of the U.S. Department of Agriculture was regrouped and reoriented under a Director of Agricultural Economics, reporting directly to the Secretary of Agriculture. It is most appropriate, therefore, that this issue carry an introductory article by the new Director, outlining the historical development of economic and statistical research in the Department in relation to the new organization covering these fields.*

IT IS SAID that "the farm problem is always with us." Actually, there has never been a single farm problem. Farmers, like the population as a whole, face different problems in different areas and commodities.

For the last 40 years, however, maladjustments of an economic nature have overshadowed drought, flood, pests, diseases, and other problems of a physical nature. In peacetime, the basic problem was one of oversupply and dragging farm income. In wartime, the basic problem was one of short supplies and skyrocketing prices. And around these great problems there have been a whole series of lesser adjustment problems. The resolution of these problems, in part if not fully, has helped the farmer and the Nation. As agriculture continues to develop in the affluent United States setting, new problems of an economic nature will arise. These in turn will demand solutions.

The techniques and tools available to economic research can be brought to bear on these problems—the old ones and the new ones. That is one reason why agricultural economic research work has been brought together in the Economic Research Service. There, its strength will not be dispersed in bit-by-bit approaches. Instead, it will be marshalled against the tough and continuing problems of agriculture. The unification of functions under the Statistical Reporting Service likewise strengthens this area of research in the Department.

The past history of economic research in the Department shows clearly that it has been most effective when it has been under a unified direction. This kind of direction encourages contributions to the development and evaluation of policies and programs. Economic research should not be carried out in a vacuum. It must be related to other research work as well as to the economic programs of the Department. It is one part of the agricultural "research community," which includes all of the research carried on in the Department of Agriculture and the Land Grant College system.

Early Developments in USDA

Agricultural economic research is often traced to 1839, when Congress appropriated $1,000 to the Patent Office for collecting agricultural statistics, conducting agricultural investigations, and distributing seeds. In 1842, the Patent Office published some of the farm statistics which had been collected in the census of 1840. The Patent Office issued estimates of agricultural production for the next 7 years, projecting them from the census base. The Commissioner of Patents commented on these tables in modern terms: "These annual statistics will, it is hoped, guard against monopoly or an exorbitant price."

The estimates were attacked in several quarters and were abandoned in 1848. However, the bill establishing a separate Department of Agriculture, signed by President Lincoln on May 15, 1862, directed the Commissioner to collect statistics. The Department began the publication of monthly reports on crop conditions and annual reports on agricultural production in 1863. Since that time, the work has been refined and detailed. It now supplies the data essential to economic analyses in agriculture.

The statistical data were used very early in making economic analyses of one type and another. By 1890, for example, the Bureau of Animal Industry had developed a theory with respect to what later was called the corn-hog ratio. At even earlier dates, the suggestion was made that farm management might be put on a more effective basis. This work was established in the Bureau of Plant Industry in 1902. The Office of Farm Management was established in 1905.

The Department published its first marketing bulletin in 1897, but had pointed out earlier that the statistics it published should aid farmers in meeting market demands. Investigations of foreign markets had begun in the 1880's. In 1894, a Section of Foreign Markets was established. The movements for inspection and, later, standardization, both began as means of aiding the sale of American farm products abroad. Since then, both research and active trade promotion abroad have been carried out by the Department.

BAE Established

An Office of Markets was established on May 16, 1913, to consolidate the marketing work being done by various bureaus, to facilitate its expansion, and to assist in solving problems connected with the marketing of farm products. In the same year, a Rural Organization Service was established. This service was combined with the Office of Markets in 1915. A number of other changes took place during the next few years until, on July 1, 1922, the Bureau of Agricultural Economics was established.

The key to the organization of a Bureau of Agricultural Economics lay in the economic maladjustments faced by farmers, beginning with the sharp break in farm prices in the summer of 1920. The Secretary of Agriculture needed a broad analysis of current problems which apparently could not be supplied by the specialized agencies. The new organization was to supply this lack.

The Bureau of Agricultural Economics applied the techniques of economic research to farm problems. The problems were varied and provided a demonstration of the effectiveness of the economic approach under a unified organization. Economic research provided bases for a number of programs which were eventually administered by other organizations.

The idea of improving the farmer's position by establishing market grades and standards had gained wide support before World War I. The work, begun in the Bureau of Markets, was carried on within an economic framework by the Bureau of Agricultural Economics. Eventually, this work was administered outside BAE, but during its formative years, it needed the kind of integration that only economists could provide.

A Division of Cooperative Marketing was established in BAE in 1926, giving formal organization to work that had been carried on for some years. In 1929, this division, which encouraged and aided farmers in establishing cooperatives, was transferred to the Federal Farm Board. Later it was transferred to the Farm Credit Administration; today, as the Farmer Cooperative Service, it is giving farm groups major assistance.

First Outlook Conference

When BAE was created, many workers in the Department and the States felt that some means should be developed for getting the results of economic research out to farmers in a usable form. The first Outlook Conference, held in April 1923,

marked the beginning of a program continuing to the present. Conferences have been supplemented by regularly published economic analyses of major farm commodities.

The Department had been doing some work on foreign agriculture for many years. The newly established BAE emphasized the gathering and analysis of data. Its importance was recognized in 1930 with the establishment of the Foreign Agricultural Service Division. In 1938, this work was transferred to the Secretary's office. It became a part of the Office of Foreign Agricultural Relations the year following.

Economic analysis became essential to the farmer and the Nation during the years of the great depression and the New Deal. The administrators of new programs relied heavily upon economists for both data and analyses. The studies of farm income and work on the concept of parity, for example, were basic to program implementation.

The broad view of problems, which is, or should be, typical of the economist, led directly to the establishment of important programs. The development of a food stamp plan as a means of attacking the farm surplus problem by expanding domestic consumption is an example. One of the leading economists and statisticians in BAE studied the direct distribution of food to needy persons and concluded that the program could be improved from the standpoint of both farm relief and social welfare. The alternative program he devised was to make surplus foods available at lower prices to low-income families. This idea, which was put into effect in 1939 through the food stamp plan, gave low-income families an opportunity to improve their diets by choosing needed quantities of surplus foods.

BAE in World War II

A major reorganization of BAE took place in 1938, when it became the planning and economic research organization of the Department. The economic research work was integrated with the formulation of plans and programs. The work in State and county land use planning ended in 1942 at the direction of Congress.

During World War II, BAE was concerned primarily with furnishing information to be used in planning for maximum agricultural production, meeting agricultural problems caused by the war, planning for the postwar period, and making economic analyses for the war agencies and the public. Much of the work of the Combined Food Board and of the Office of Price Administration drew heavily upon the Bureau's analytic programs.

At the end of 1945, the Bureau's program planning work was transferred to the Office of the Secretary. The Bureau was designated the authorized source of economic information and was to supervise and coordinate economic and statistical research in the Department. During the next few years, economic analysis was brought to bear on the difficult problems of reconversion and the Korean War.

On November 2, 1953, the Bureau of Agricultural Economics was abolished. Its functions were transferred to the Agricultural Research Service and the Agricultural Marketing Service as a part of a larger reorganization of the Department of Agriculture. The theory of organization was to organize or bring together "the appropriate team of scientists or researchers to attack particular problems. . . . In short, the leading principle in the reorganization plan has been to look at the problems facing the farmers and the industries that handle farm products rather than the scientific background or training of the particular personnel involved."

A number of leading agricultural economists criticized the abolition of BAE. The major argument against the action was expressed thus: "A department of agriculture organized around 'particular problems' is in danger of letting fundamental research 'fall between,' and also in danger of running out of the basic background material which is essential to promoting progress in farm practices, and to understanding current problems as they come upon the scene."

Current Organization

The problem approach to research was in effect from 1953 to 1961, with emphasis on marketing, both domestic and foreign.

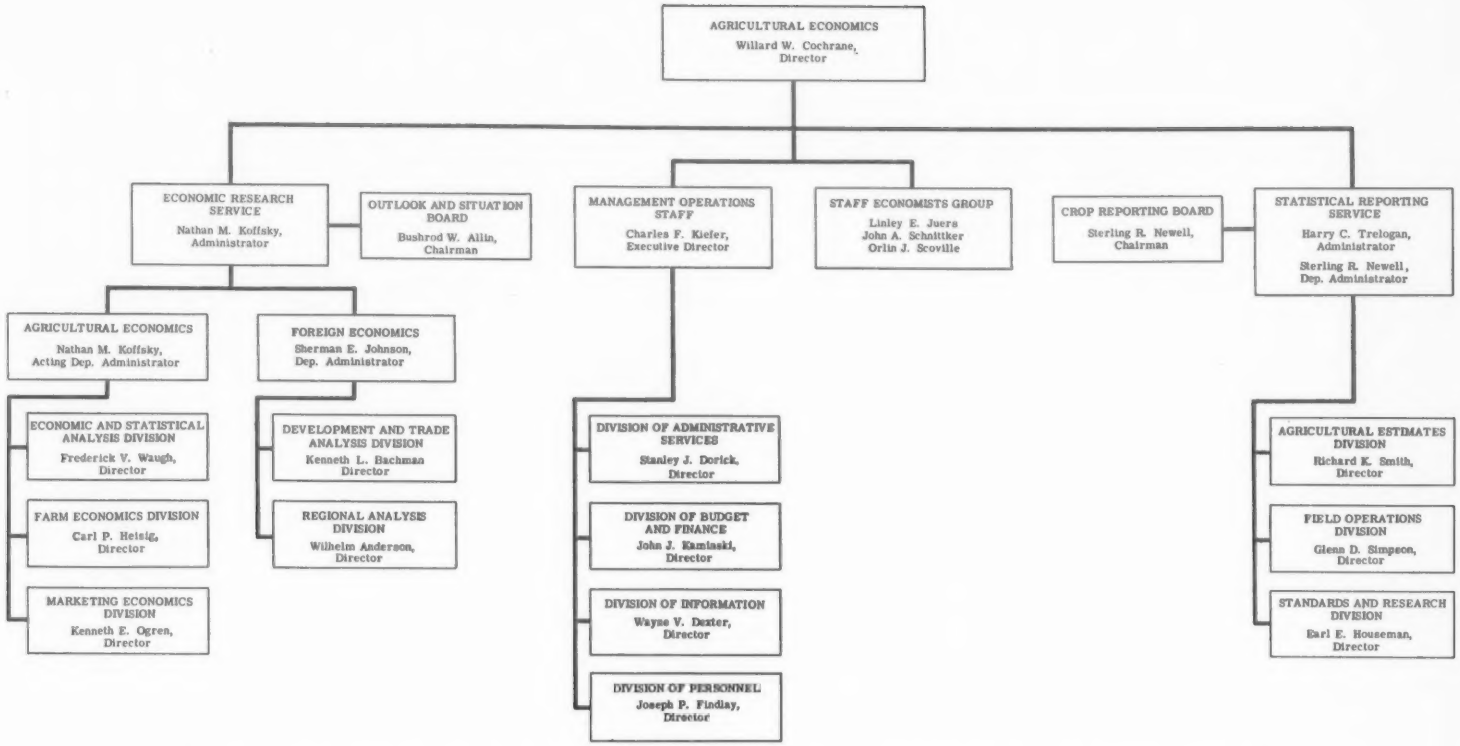

Figure 1. Organization Chart of Agricultural Economics, U.S. Department of Agriculture, June 1961.

On February 24, 1961, Secretary Orville L. Freeman gave public notice of a plan to reorganize research in agricultural economics and statistical reporting under the guidance of a Director, Agricultural Economics, effective April 3, 1961. An organization chart is shown on page 72.

The Director, Agricultural Economics, is administratively at the level of Asssistant Secretary. He exercises general direction and supervision of the Economic Research Service and the Statistical Reporting Service.

The newly established Economic Research Service includes the functions formerly carried out by the following units of AMS: Agricultural Economics Division, Market Development Research Division (except Market Surveys Branch), Marketing Economics Research Division, Outlook and Situation Board, and the economics research activities of the Transportation and Facilities Research Division; the functions of the Farm Economics Research Division of the Agricultural Research Service; and the functions of the Foreign Agricultural Analysis Division and International Monetary Branch and Trade Statistics Branch of the Trade Policy Division of the Foreign Agricultural Service.

The Economic Research Service is headed by an Administrator. The work is further divided between two Deputy Administrators. The Deputy Administrator for Agricultural Economics is responsible for the Economic and Statistical Analysis Division, Marketing Economics Division, and Farm Economics Division. The Deputy Administrator for Foreign Economics is responsible for the Development and Trade Analysis Division and the Regional Analysis Division.

The Statistical Reporting Service is responsible for the functions formerly carried out by the following units of AMS: Agricultural Estimates Division, Crop Reporting Board, Market Surveys Branch of the Market Development Research Division, and Statistical Standards Division.

The Statistical Reporting Service is headed by an Administrator and Deputy Administrator. The work is carried out by the Agricultural Estimates Division, the Standards and Research Division, and the Field Operations Division.

Two innovations have taken place in the organization. First, a Staff Economists Group has been established under the immediate supervision of the Director, Agricultural Economics. This small group assists the Director in the development of short- and long-range economic research and statistical work required by the Secretary of Agriculture, undertakes analytical studies of current and proposed agricultural programs, and represents the Director in the economic and statistical review of program actions.

The second innovation was the establishment of a Management Operations Staff reporting to the Director, Agricultural Economics. The Staff is headed by an Executive Director and has four divisions: Administrative Services, Budget and Finance, Information, and Personnel. This experiment in administration, where the one staff serves both the Economic Research Service and the Statistical Reporting Service, is aimed at achieving greater economy and efficiency and at freeing program administrators and their staffs for program work.

The Future

The Secretary said, in discussing the new agencies: "They will put renewed vigor into providing better information to U.S. farmers, ranchers and consumers and to foreign countries on agricultural needs both in the United States and abroad. This also will help the Department develop a food budget that will give hard figures on normal needs of food and fiber for our own people, supplemental needs for distribution to the needy, and overseas needs in terms of our foreign economic program."

Once again, the full economic research and statistical resources of the Department will be brought to bear upon agricultural and food problems. But economic research will not be confined to solving problems. As one of the Nation's leading agricultural economists said:

"When the work is properly organized in a favorable environment, science grows, methods of research continually improve, knowledge accumulates and enables men better and better to understand the world in which they work. A knowledge of the setting in which farmers operate and a knowledge of the trends of the times are essential

to lighting the pathway of progress as well as to diagnosing ills."

The role of economics in the Department of Agriculture is to make both basic and applied economic research a force for the betterment of all groups in our Nation and in the world. The work as now reorganized will better permit the realization of this role.

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Some Economic Aspects of Food Stamp Programs

By Frederick V. Waugh and Howard P. Davis

La meilleur de tous les tarifs serait celui qui ferait payer à ceux qui passent sur une voie de communication un peage proportionnel à l'utilité qu'ils retirent du passage.[1]—Jules Dupuit, 1849.

FROM AN ECONOMIC STANDPOINT, the essential thing about food stamp programs is not that people can buy food with stamps instead of with money. The essential feature of these programs is that low-income people can buy food at reduced prices. The food stamp (or coupon) is simply a convenient mechanism for enabling these families to pay lower prices, and for enabling the Government to make up the difference by a subsidy from the Federal treasury.

Thus, any form of food stamp program (including the program operated in the United States from 1939 to 1943, and also including the pilot programs recently started in eight experimental areas of this country), is essentially a classified price arrangement. In principle, it is something like classified milk prices, where part of the milk is sold as fluid milk at a class I price and the surplus is sold for cream and manufactured dairy products at lower class II and class III prices. Economists often call such arrangements "price discrimination" or "multiple pricing."

The quotation at the beginning of this article, from the French engineer-economist Jules Dupuit, refers to the system of tolls on bridges and highways, as well as to freight rates on railroads. Dupuit advocated a system of classified tolls or charges in which each commodity and each group of persons would pay rates proportional to the "utility they received." This argument is similar to the argument that freight rates, for example, should be based on the "value of service," or to the one that medical bills should be graduated according to "ability to pay."

Multiple prices may be profitable or unprofitable to the producer. They may benefit or harm the consuming public. A few economists have discussed both aspects of this problem. One of the best discussions since Dupuit is that of Robinson.[2] The main principle is illustrated in figure 1. This diagram does not represent the food stamp program exactly. Rather, it shows how a food stamp program would work if it were a simple 2-price arrangement.

Both sides of the diagram assume that a given amount of food is available. Two demand curves are assumed to be known: The demand by medium- and high-income families, and the demand by needy families. In analyzing 2-price arrangements, it is convenient to show the first of these demand curves in the ordinary way, but to reverse the demand curve for needy families— plotting it from right to left instead of from left to right.

If the market were entirely free and competitive, the price would be determined by the intersection of the two demand curves. Assume that this price is low and that the public generally agrees that some program is needed to raise farm

[1] The best system of pricing would be one that requires each user of a bridge, highway, or railroad to pay a charge proportionate to the benefits he gets.

[2] Robinson, Joan, THE ECONOMICS OF IMPERFECT COMPETITION, chapters 15 and 16. Macmillan. London. 1938.

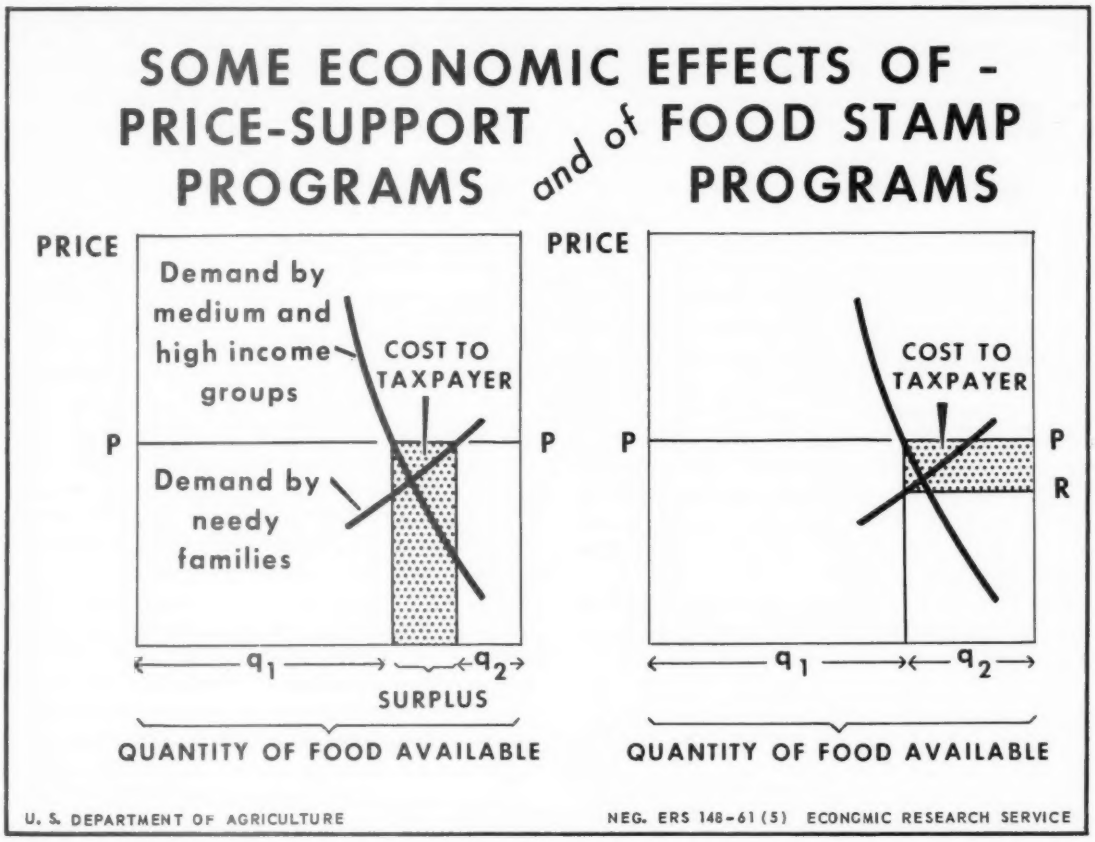

Figure 1.

prices and income. One way of doing this is that shown on the left grid of the diagram. This represents a simple price-support program under which prices are increased to the level marked P. At this price, medium- and high-income groups will buy the quantity marked q_1 and needy families will buy the quantity marked q_2. These two quantities together are less than the amount of food available, leaving the surplus that must be bought by the Government. The cost of this program to the taxpayer is the shaded area marked in the diagram.

The right side of the diagram illustrates what would happen under a simple form of food stamp operation, in which low-income families were allowed to buy as much as they pleased at a discount price. Assume the same level of price support P. But assume that the discount $D=P-R$ is so adjusted that needy families will buy and consume the surplus. The cost to the taxpayer is then the shaded area in the diagram to the right.

The purpose of these two diagrams is not to demonstrate which type of program would cost the taxpayer more. This depends upon the slopes of the two demand curves. We do not yet have an accurate statistical measurement of the demand curve for food by needy families. But in any case some one must pay for any agricultural program that raises farm income. The type of program may determine how these costs are divided between the taxpayer and the consumer of food.

An analysis along the lines shown graphically in the diagram to the right of figure 1 shows that if a producer can divide his market into two parts, one of which is more elastic (or less inelastic)

than the other, he would generally find it profitable to charge a higher price in the less elastic market and a lower price in the more elastic market. The mathematics and geometry presented by Robinson are in terms of marginal returns from the two markets. Assuming that the two markets are independent of one another, and that marginal returns from market 1 are less than from market 2, it will always be profitable to shift part of the supply from market 1 to market 2.

Economists are accustomed to thinking in terms of elasticities of demand rather than in terms of marginal returns. These concepts are closely related. In fact, if MR represents marginal returns, if P represents price, and if e represents elasticity $MR=P\ (1+1/e)$. While economists do not have as much information as they would like about the demand for food by needy families, they have reason to believe that this demand is less inelastic than is the demand for food by medium- and high-income groups.

This means that the marginal returns from food sold in the low-income market are probably greater than the marginal returns from food sold in the medium- and high-income market. For this reason, a good, workable food stamp program would be not only a welfare program to help needy families, it would also be one of the most effective programs—dollar for dollar—for maintaining farm income.

This does not mean that a domestic food stamp program alone would be big enough to handle all surplus problems in agriculture and give farmers a satisfactory income. But it does mean that a dollar spent for a good food stamp program might return as much or more to the farmer than a dollar spent for most other farm programs.

The Present Pilot Food Stamp Programs

Beginning about the first of June, pilot food stamp operations were undertaken in eight areas of the country: Franklin County, Ill.; Floyd County, Ky.; Detroit, Mich.; the Virginia-Hibbing-Nashwauk area of Minnesota; Silver Bow County, Mont.; San Miguel County, N. Mex.; Fayette County, Pa.; and McDowell County, W. Va. These are the "distressed areas" where there are substantial amounts of unemployment and many families receive low incomes.

In these areas, State and local welfare agencies have certified needy families for participation in the stamp program whose incomes are so low that they are unable to afford the cost of an adequate diet. Families with no income get food stamps free of cost, but these families constitute a small proportion of the total number participating. Most families have some income. Those families choosing to participate are charged varying amounts for food coupons, with the charge graduated according to their incomes. The program is entirely voluntary.

If a family chooses to participate, it must buy enough coupons to provide an improved diet. The family uses these coupons to buy food in local retail stores. The participation of retail stores is also voluntary. If a store wants to participate, the owner must apply for permission and be approved. Participating stores receive the food coupons from needy families and cash them at face value at their local banks.

For the present, these pilot programs are limited to the eight areas mentioned. The program will be much too small to have any noticeable effect on the country as a whole. These pilot operations are intended to determine whether it would be feasible to develop a national food stamp program that might eventually raise the nutritional levels of the Nation and redirect our agricultural productive capacity into foods for which there is a greater current need. Without in any way prejudging what these pilot operations may show, it is appropriate at the start to consider how food stamp programs may affect various groups of people, including low-income consumers, food trades, taxpayers, and farmers.

Low-Income Consumers

The pilot stamp programs will enable needy families in the eight areas to buy more nearly adequate, balanced diets. They will not compel them to buy these diets unless needy families choose to do so, but they will give them enough food purchasing power to do so if they choose. The extent to which participating families improve their diets will depend in some degree upon the success of educational efforts to help them spend their food coupons as wisely as possible.

The direct distribution programs that we have had in the past did not pretend to enable low-

income families to get adequate diets. They were much too small for this purpose, and they were restricted to a few foods—in many instances not the foods most needed to improve the diets of low-income families.

The other main feature of the pilot food stamp program is that it gives needy families practically free choice as to the foods they buy with their coupons. The present regulations governing the pilot operations define "eligible foods" to mean "any food or food product for human consumption, except coffee, tea, cocoa (as such), alcoholic beverages, tobacco, and those products which are clearly identifiable from the package as being imported from foreign sources."

At first, many officials in the U.S. Department of Agriculture thought it might be necessary to limit the use of coupons to certain listed foods, or to post in each store a list of ineligible foods. From an administrative standpoint, this would have been a complicated procedure.

The former food stamp program, which operated from 1939 through 1943, used stamps of two different colors. The orange-colored stamps (which were bought by the participating families) could be used to buy any food. The blue stamps (which were paid for by the Government) could be used only to buy foods designated as in surplus.

In principle, the idea of two colors of stamps has a great deal of appeal. But actually, the blue stamps were never very effective in concentrating the additional purchases on surplus items. This was true because the families substituted the "blue stamp" purchases for their normal purchases of these items, and essentially their increased purchasing power resulted in increased total purchases of those items for which they had a greater need.

This might have been different if the "surplus list" had been limited to a very few commodities for which the families had a greater need. And it might have been different if the "surplus list" had been limited to a very few commodities for which the families had real urgent need.

What commodities will benefit under one color of stamp remains to be demonstrated. It is one of the principal things being tested in the pilot operation. From an administrative standpoint, it is easier to operate a program with coupons of one color than with those of two or more colors. Moreover, from the standpoint of the needy families, it is desirable to have as much freedom of choice as possible. Professional welfare experts are generally agreed that "relief in kind" is less desirable than a relief payment in money. The use of food coupons is restricted to foods, but obviously it gives families a greater choice than direct distribution under which they take whatever foods are handed out.

Despite the benefits we have enumerated, some needy families may prefer direct distribution to a food stamp program. Under the direct distribution program, eligible families get a certain quantity of free food without regard to the normal food expenditures for their income group. They can, therefore, divert varying amounts of their previous food expenditures to other nonfood needs. If they participate in a stamp program, they must pay an amount roughly equal to the normal food expenditures of their income group. The Department will carry on an intensive research program during the test period in the pilot areas. Part of this research will deal with consumer attitudes and preferences.

Food Trades

From the standpoint of the food trades, the main feature of the stamp program is that it is operated by and through private industry. The Government does not buy surplus foods and distribute them to needy families in competition with commercial food distribution; it simply enables needy families to buy foods in their local retail stores. The private food trades do all the buying, processing, and distributing. The program will provide a net increase in food sales.

On the other hand, any food stamp program involves some inconvenience and cost to the food trade. Perhaps the managers of stores have become accustomed to such inconvenience as trading stamps and various kinds of coupons under special advertising deals. The food stamp program is voluntary, but present indications are that all retailers will be glad to take part.

Taxpayers

As previously indicated, someone pays for any program that raises farm incomes. But there may be some misunderstanding as to the relative costs of stamp programs and direct distribution.

A fully adequate national food stamp program would probably be fairly expensive. Certainly,

it would cost substantially more than the inadequate direct distribution program we have had in recent years. In a sense, the reason direct distribution programs have generally been felt to have cost practically nothing is because we have simply given away food surpluses that were already owned by the Commodity Credit Corporation.

Recently, the direct distribution program has been substantially increased by adding meat and a number of other vegetable protein foods. If the direct distribution program were expanded until it provided adequate diets, it might well cost more than a food stamp program. This is because it is doubtful that Government distribution can be accomplished for a relatively small number of persons as effectively or as cheaply as our highly developed commercial food-distribution system, which serves the total population.

One of the main purposes of research planned as a part of the pilot program is to make an accurate and reliable appraisal of cost in relation to dollar amounts, as well as kinds, of increased food consumption.

Farmers

Some critics of food stamp programs emphasize that they will not help the main surplus commodities such as wheat, feed grains, and cotton. This is correct. The benefits of food stamp programs will probably be concentrated largely on meats, poultry and eggs, dairy products, and fruits and vegetables. Indirectly, they can be of substantial assistance to corn and other feed grains. In other words, the farm products that these programs will help most are the nonbasic perishable commodities. These are the commodities that Section 32 (an Act to increase the domestic consumption of non-price support, perishable commodities) was designed to assist. The pilot stamp program is being financed from Section 32 funds.

Although food stamp programs will probably never do much to help wheat and cotton, they could, if extended to all needy families throughout the Nation, help to meet the general problem of overcapacity in agriculture. This is not to say that any domestic food program alone is likely to be big enough to prevent surplus problems in the future. We will need many different kinds of programs, including export programs and some means of adjusting production.

But if the pilot operations show us how to develop a workable and effective food stamp program, such a program can be of substantial benefit to farmers in the future.

Reprints of the article concluded on this page are available on request. Write to Economic Research Service, U.S. Department of Agriculture, Washington 25, D.C.

Cost Functions From Cross-Section Data—Fact or Fantasy?

By J. F. Stollsteimer, R. G. Bressler and J. N. Boles

Production and cost functions have long been recognized as vital components of economic analyses relating to the individual firm. The U.S. Department of Agriculture, beginning with the pioneering work of W. J. Spillman, has been a continuing participant in their empiric and theoretical development. Whereas early work emphasized farm production and cost functions, much attention has centered lately on the marketing firm. This attention has brought into sharper focus certain organizational and operating characteristics of plants. With growing interest in the marketing area, the work in the Department expanded to include cooperative research with several State experiment stations. A major such effort has involved the Marketing Economics Division, Economic Research Service, and the California Agricultural Experiment Station. This is the first of three papers prepared for publication in Agricultural Economics Research to reflect some aspects of theoretical and methodological developments in these studies. The following paper comments on, and extends the results of, a statistical analysis of costs in the operation of feed mills developed in a cooperative study with the Iowa Agricultural Experiment Station, and reported in this journal by Richard Phillips in 1956. In a second paper the authors will deal with the possibilities of developing production and cost functions from more detailed analysis of accounting records of individual firms. A third paper will discuss the technique of plant cost synthesis. This report grew out of research in plant cost and efficiency carried on cooperatively by the Marketing Economics Division, Economic Research Service, and the Giannini Foundation of Agricultural Economics, University of California at Berkeley. The authors are indebted to L. L. Sammet, B. C. French, and D. B. DeLoach of the University of California, and W. F. Finner and V. J. Brensike of the Economic Research Service, U.S. Department of Agriculture, for their helpful suggestions during the preparation of this paper.

WITH THE CURRENT emphasis on cost and efficiency research, attempts to develop empirical representations of short- and long-run cost functions are both common and important. Two principal approaches to quantification are: (1) the synthetic method—building up descriptions of cost functions from detailed study of plant stages and operations and the integration of these stages to represent the total plant operation, and (2) the statistical approach, deriving relationships from the analysis of aggregate cost and volume data.

The synthetic method frequently involves relatively large and expensive research inputs. It is suspect in some quarters because of the "unreal" connotation of its name. The statistical approach, on the other hand, frequently utilizes readily available "cross-section" data. It can, therefore, produce results with relatively small research cost, and it has the added appeal of reflecting "real" plant operations. Furthermore, the regression coefficients obtained can be subjected to statistical tests of reliability, though this may be an advantage of dubious value.

This paper reports on a series of pragmatic explorations of the nature of results obtained by the statistical analysis of cross-section data. It has its immediate origin in a report by Richard Phillips of Iowa State University published in 1956, and, in a real sense, is a continuation of the methodological inquiry of that paper.[1] The authors are indebted to Professor Phillips for his assistance in making available details of his data and of revised analyses, as well as for his critical comments on earlier versions of this report.

[1] Richard Phillips, "Empirical Estimates of Cost Functions for Mixed Feed Mills in the Mid-West," *Agricultural Economics Research*, vol. VIII, no. 1, January, 1956, pp. 1–8.

The General Approach

Basic data for the investigation covered in this report are from the Phillips study of 29 feed mills. They include (1) V—total annual volume in tons of feed mixed; (2) C—total annual costs for each plant; and (3) K—annual capacity in tons of feed mixed.[2] Annual volume and capacity data can be combined in appropriate ways to define other related variables such as excess capacity, capacity rates per hour, or equivalent full-time hours or days of operation per year. These data are more or less typical of cross-section data available for samples of marketing or processing plants, although the capacity information represents a somewhat unusual and strategic addition.

These data were used in all formulations reported in this paper. The basic approach was to select a number of alternative models or type equations for the cost relationship, apply these to the single set of data, and, finally, to compare and contrast the results. All models use both volume and capacity, directly or indirectly, as independent variables in the regression analyses and total annual costs as the dependent variable.

For any of the models used, the application of multiple regression techniques results in an equation relating total annual cost to annual volume and capacity. Both short- and long-run cost functions may then be obtained from the multiple regression equation.

Short-run functions are described by specifying alternative levels of capacity—each assumed to be associated with a specific but undefined fixed plant—and then relating total annual cost to annual volume for volume up to but not exceeding the selected annual capacity.

A long-run cost function is computed for each model by specifying alternative annual volumes and then selecting for each volume the plant capacity which will minimize costs, subject to the condition that annual capacity is greater than, or equal to, the selected annual volume.

In some cases, the resulting long-run equation can be obtained directly from the regression equation by setting capacity equal to volume or excess capacity equal to zero—these correspond to the familiar "J-shaped" average cost curves found in empirical analyses. In others, costs are minimized by selecting capacities somewhat in excess of the selected volumes—these represent the tangency solutions emphasized in Viner's classic paper.

Four general types of models were used in these investigations, with a number of specific forms: (1) the original Phillips model of general form $C=b_1V^n+b_2(K-V)$: (2) a modification of the Phillips model with nonzero intercept in the general form $C=a+b_1V^n+b_2(K-V)$; (3) a series of models involving constant marginal costs for any short-run function and with fixed costs increasing with capacity, representing various elaborations of the form $C=(a+b_1K)+(b_2+b_3K)V$; and (4) an illustration of a form developed graphically as an envelope function rather than by conventional regression techniques. The specific forms used are discussed in the paragraphs that follow.

Model 1.—This is the original Phillips form, and Equations 1a, 1b, 1c, and 1d—(table 1)—are the Phillips results obtained for specific values for n of 0.5, 0.7, 0.8, and 0.9. Phillips apparently chose this form on the basis of two of its properties: (1) it yields a total cost function which increases at a decreasing rate and (2) passes through the origin. He states that "such a model is logical because total costs should be zero when both output and unused capacity are zero."[3] In addition, Equations 1e and 1f have been fitted, using n values of 1.0 and 1.1. For all of these equations, the long-run cost function is obtained by specifying particular values for V and determining the values for capacity K which will minimize costs, subject to the conditions that $V>0$, $K>0$, and $K\geqq V$. The change in total cost with respect to change in capacity is given by the partial derivative, or:

$$\frac{\partial C}{\partial K}=b_2$$

If b_2 is positive—as it must be to be logically admissible—the total cost of producing any volume V will be minimized by making capacity K as

[2] Estimates of capacity were based on actual peak weekly output during past plant operations, rather than on engineering measurements. Peak weekly volume was divided by the corresponding weekly hours of plant operation to obtain an estimate of capacity output rate per hour. Annual capacity was defined in terms of operations for 22.5 hours per day, 6 days per week, and 52 weeks per year. Actual plant volumes ranged from 466 to 141,775 tons per year. Plant capacities for the sample plants ranged from 7,020 to 585,000 tons per year.

[3] Phillips, op. cit., p. 5.

small as possible, that is $K=V$. The long-run cost function thus reduces to:

$$C=b_1V^n, \qquad V=K,^4$$

A function that passes through the origin and which will show economies of scale when n has values less than 1.0, constant returns to scale when n equals 1.0, and diseconomies of scale when n has values greater than 1.0.

Short-run or plant cost functions are obtained from the multiple relationship by assigning any constant value for capacity, say $\overline{K}$, and expressing C as a function of V:

$$C=b_1V^n+b_2(\overline{K})-V$$

Short-run marginal costs are then defined, with K fixed at $\overline{K}$, by the derivative:

$$\frac{dC}{dV}=nb_1V^{n-1}-b_2, \qquad V\leq\overline{K}$$

When n is positive but less than 1.0, short-run marginal costs decline monotonically with increases in volume and eventually become negative. This must be regarded as questionable on a priori grounds even in the ranges where marginal costs are positive and, of course, is quite unacceptable in volume ranges where the indicated marginal costs are negative. That is to say, we must reject on logical grounds a total cost curve for a plant which increases with volume to a maximum and then decreases—suggesting that the plant could produce larger volumes for lower total cost than some smaller volumes. When n equals 1.0, indicated marginal short-run costs are constant regardless of volume—the total cost curve is linear. When n is greater than 1.0 but less than 2.0, marginal costs increase throughout the entire range of volume, but at a decreasing rate—a peculiar form when compared to usual theoretical constructs.

Model 2.—This formulation is identical with the original Phillips model except that the functions are not forced through the origin. This modification was made after it was observed that the original equations generally overestimated costs for the smaller plants. Equations 2a, 2b, 2c, and 2d have assigned n values of 0.5, 0.7, 0.8, and 0.9 and so correspond to original Equations 1a through 1d. Notice that, if the fitted intercept values are negative, the indicated total costs will be negative for very small values of V and K. While this is obviously unacceptable, the form may give good descriptive "fits" over most of the relevant ranges.

Model 3.—A priori reasoning about the operation of mechanized processing plants suggests that short-run marginal costs will be constant if equipment operates at fixed output rates and if annual volume is varied, either by varying the number of parallel lines operated, or by varying the number of hours of plant operation. It is also reasonable to expect that fixed costs will be an increasing function of capacity. If plant capacity is increased by the addition of identical, parallel lines, fixed costs should increase in an approximately linear (but discontinuous) relation with capacity, while short-run marginal costs should be unaffected by plant size. On the other hand, if capacity is increased by using larger and larger items of equipment, short-run marginal costs would probably decrease with increases in capacity. The specific equations selected to reflect these possibilities are:

3a: $C=a+b_1V+b_2K$

3b: $C=(a+b_1K)+(b_2+b_3K)V$

3c: $C=(b_1K)+(b_2+b_3K)V$

3d: $C=(a+b_1K+b_2K^2)+(b_3+(b_4K+b_5K^2)V$

Notice that, for all of these equations, short-run marginal costs are constant. That is, for any fixed capacity, short-run marginal costs are not a function of volume. For Equation 3a, short-

[4] This function has the following properties depending upon the value of n:

	$0<n<1$	$1<n<2$	$n=1$
Total cost $=C=b_1V^n$; $V=K$	Increases monotonically.	Increases exponentially.	Increases linearly.
Marginal cost $=\frac{dC}{dV}=nb_1V^{n-1}$	Positive.	Positive.	Positive equal to b_1.
Slope of marginal cost $=\frac{d^2C}{dV^2}=n(n-1)b_1V^{n-2}$	Negative asymptotically approaches zero.	Positive increases at a decreasing rate.	Zero.

run marginal costs are also independent of capacity.[5] With Equations 3b, 3c, and 3d, however, short-run marginal costs are related to capacity. Equations 3b and 3c specify marginal costs as linear functions of capacity and differ only with respect to the constant term. Equation 3c is forced through the origin. Equation 3d expresses both short-run fixed and marginal costs as quadratic functions of capacity and thus permits, at least, a preliminary exploration of curvilinear relationships.

If b_2 is positive in Equation 3a, as is to be expected, the long-run cost function is defined by setting capacity equal to volume, or:

$$C=a+(b_1+b_2)V$$

For Equations 3b and 3c, short-run marginal costs for any plant with capacity K are given by the partial derivative:

$$\frac{\partial C}{\partial V}=b_2+b_3K$$

we expect b_3 to be negative, reflecting the tendency for larger plants to have lower marginal costs. With these linear formulations, as noted earlier, projections for plants with very large capacity would indicate *negative* short-run marginal costs.

Long-run cost functions for Equations 3b and 3c are defined by setting capacity equal to volume, providing volume is restricted to the range where:

$$\frac{\partial C}{\partial V}=b_1+b_3V>0$$

For the fitted equations, this derivative is negative for annual volumes greater than 235,000 tons for Equation 3b and 245,000 tons for Equation 3c—values substantially smaller than the largest capacity reported for sample plants.

Model 4.—This differs from the previous models in that it has been fitted graphically as an "envelope" function rather than by statistical regression techniques. In brief, plant capacity and plant volume are taken as the base dimensions of a 3-dimensional figure, with annual costs measured vertically above this base. The desired cost function is a surface fitted as an envelope from below to the scatter of individual plant cost points. For convenience in presentation, the resulting surface was represented approximately by an algebraic equation. Finally, a multiple correlation coefficient was calculated as a convenient summary description of the "fit" by comparing deviations between actual and estimated costs with the variance in actual costs. No attempt was made to improve the fit by adjusting the surface, though some effort in this direction would normally be justified and could be expected to yield higher correlation coefficients. Notice that the envelope relationship attempts to define relatively efficient operations with actual costs lower than those achieved by most plants; as a consequence, the correlation coefficient should be somewhat lower than those obtained for average relationships by conventional regression techniques.

The particular approach used to develop this function was (1) to stratify the sample plants on the basis of capacity, (2) to prepare cost-volume scatter diagrams for each strata, and (3) to plot straight-line cost-volume relations for each strata. Each of these straight lines was fitted at or near the bottom of the scatter diagram, and each may be considered an estimate of the short-run total cost function for plants of indicated capacity when designed and operated with reasonable efficiency. The resulting intercepts (fixed costs) and slopes (marginal costs) from the several strata relationships were then plotted against capacity to be "faired" into a smooth surface and finally expressed algebraically in the form:

$$4a:\ C=b_1K^n+\frac{b_2}{K^m+b_3}$$

Selection of this particular form was guided entirely by the slope and intercept values from the graphic traces and not by any a priori considerations. The long-run cost function derived from this equation, however, is especially interesting. With relatively small values for V, total cost is minimized by using plants with excess capacity since the increase in fixed costs is more than offset by the reduction in variable costs.[6]

[5] Note that this is equivalent to the Model 2 form with $n=1.0$; an Equation 2e can be obtained from 3a as follows:

$$C=a+(b_1+b_2)V+b_2(K-V)$$

The correlation coefficient for this converted Equation 2e will be the same as for Equation 3a, of course, and can be compared with Equation 1e of the original Phillips form.

[6] An examination of the two terms of the derivative of total cost with respect to K

$$\frac{\partial C}{\partial K}=nb_1K^{n-1}+\frac{-b_2mK^{m-1}}{(K^m+b_3)^2}V$$

indicates that when

(Footnote 6 continued on p. 83.)

Note also that the variable cost term is a reciprocal function of K, thus avoiding the negative marginal costs that make some of the foregoing models questionable in higher volume and capacity ranges.

The Empirical Results

The specific results obtained by applying these several models to the Phillips feed mill data are summarized in table 1. In spite of major differences in form and in the magnitude of computed parameters, all equations "account for" a substantial part of the variance in annual costs for this sample of feed mills—all correlation coefficients are higher than 0.90. Moreover, all V regression coefficients appear to be highly significant (1 percent level) while most of the K and $(K-V)$ coefficients appear to be significant (5 percent level). In general, only the VK, the K^2, and the VK^2 regression coefficients are of doubtful statistical significance. If we followed a rule of omitting from the analysis any variable with a t ratio less than the critical value for a level of significance of 5 percent, for example, Equations 3b and 3c would be reduced to Equation 3a. Equation 3d would be altered sequentially by first dropping K^2, then VK, and finally VK^2, reverting also to Equation 3a.

It is not at all clear, however, that such a rule should be followed. The primary objective in such studies is to estimate the parameters of a cost function, not to test these particular statistical hypotheses. There is a strong a priori reason for expecting that costs will be influenced by capacity (K) and excess capacity $(K-V)$, for example, and this is a compelling basis for retaining the $(K-V)$ terms in Equations 1b and 1c even though these regression coefficients are of doubtful statistical significance. Stated in another way, these computed coefficients are the best estimates that the analyses yield for the true values and far better than assuming that the true value is zero.

(Footnote 6 continued from p. 82.)

$$nb_1K^{n-1} < \frac{b_2mK^{m-1}}{(K^m+b_3)^2}V$$

total variable costs are declining at a more rapid rate than fixed costs are rising as K is increased. Should the above conditions hold at $K=V$, the indication is that V could be produced at lower total cost in a plant with $K>V$. Whether or not these conditions obtain depends upon the value and sign of the parameters of the total cost equation.

In a similar sense, if there are good reasons to expect that volume and capacity have a joint effect on costs, then even small values for KV regression coefficients should be retained. The size of the sample may not be large enough to clearly detect differences which, though small in magnitude, may be extremely important in dictating the shape of short- and long-run cost relationships.

In spite of high correlation coefficients and generally acceptable tests of significance for most regression coefficients, many of the equations give results that must be rejected in some ranges. All equations from Models 1 and 2 with n-values of less than 1.0 involve decreasing marginal costs, as indicated earlier, and so may be suspect on logical grounds; these equations also indicate that total costs reach maximum values and then decline, although these points occur well beyond the ranges of actual volumes and capacities. In addition, the negative intercepts for all Model 2 equations must yield unacceptable estimates for low capacity and volume ranges. The cost functions given by Equations 3b and 3c reach maximum values at 235,000 and 245,000 tons, respectively, and so are clearly unacceptable for high volume and capacity estimates. Moreover, Equation 3b has a negative intercept and so must be rejected at least for very small volume and capacity situations. Finally, Equation 3d eventually reaches a maximum although at a figure well beyond actual volume and capacity ranges. The long-run average cost curve based on this equation also has a peculiar form, declining to 35,000 tons, rising to a relative maximum at 185,000 tons, and then declining.

In spite of such logical limitations, there is an implication of almost equal statistical acceptability for the above equations because of the uniformly high coefficients of correlation. The several models, however, yield widely differing estimates of the short- and long-run cost functions. This is illustrated for the long-run functions in figure 1—it would be difficult to devise a more heterogeneous set of relationships, either with respect to the indicated levels of average costs or the rates at which average costs change with increases in scale. Short-run curves are no more consistent, as suggested in figure 2 by average cost relationships for plants with annual capacities equal to 150,000 tons.

TABLE 1.—*Alternative cost equations derived from identical annual data on total costs, plant volume, and plant capacity, 29 midwestern feed mills*[1]

Model	Total cost equation [2]	Coefficient of correlation
1a	$C=1607.58V^{0.5}+0.73287(K-V)$ (6.84)oo (2.25)o	0.9211
1b	$C=208.98V^{0.7}+0.36436(K-V)$ (12.55)oo (1.73)	0.9695
1c	$C=70.042V^{0.8}+0.30140(K-V)$ (16.80)oo (1.86)	0.9820
1d	$C=22.702V^{0.9}+0.30001(K-V)$ (20.53)oo (2.25)o	0.9876
1e	$C=7.178V^{1.0}+0.34208(K-V)$ (20.79)oo (2.63)o	0.9879
1f	$C=2.229V^{1.1}+0.41178(K-V)$ (18.10)oo (2.83)o	0.9843
2a	$C=-124122+2279.41V^{0.5}+0.6177(K-V)$ (9.98)oo (2.53)o	0.9571
2b	$C=-55423+231.57V^{0.7}+0.4205(K-V)$ (15.13)oo (2.39)o	0.9791
2c	$C=-29863+73.114V^{0.8}+0.3612(K-V)$ (18.09)oo (2.40)o	0.9850
2d	$C=-8281+22.905V^{0.9}+0.3241(K-V)$ (20.26)oo (2.38)o	0.9878
3a	$C=10018+6.8193V+0.3051K$ (15.05)oo (2.27)o	0.9883
3b	$C=-2567+7.1346V+0.4638K-0.00000197VK$ (14.58)oo (2.76)o (1.51)	0.9893
3c	$C=7.1080V+0.4458K-0.00000182VK$ (15.16)oo (3.22)o (1.75)	0.9892
3d	$C=5799+6.5445V+0.2578K+0.00000083K^2$ (6.22)oo (0.43) (0.32) $+0.00000365VK-0.000000000012VK^2$ (0.61) (0.73)	0.9897
4a	$C=0.004122K^{1.4}+109.3V/(K^{0.27}-6.01)$	0.967

[1] Basic data for all models and the results for 1a, 1b, 1c, and 1d were made available by Professor Richard Phillips' Iowa State University, Ames, Iowa.

[2] In all equations, C represents total mill costs in dollars per year, V represents annual mill volume in tons, and K represents computed annual mill capacity in tons. Figures in parentheses are *t* ratios: o indicates significance at 5 percent level, while oo indicates significance at the 1 percent level.

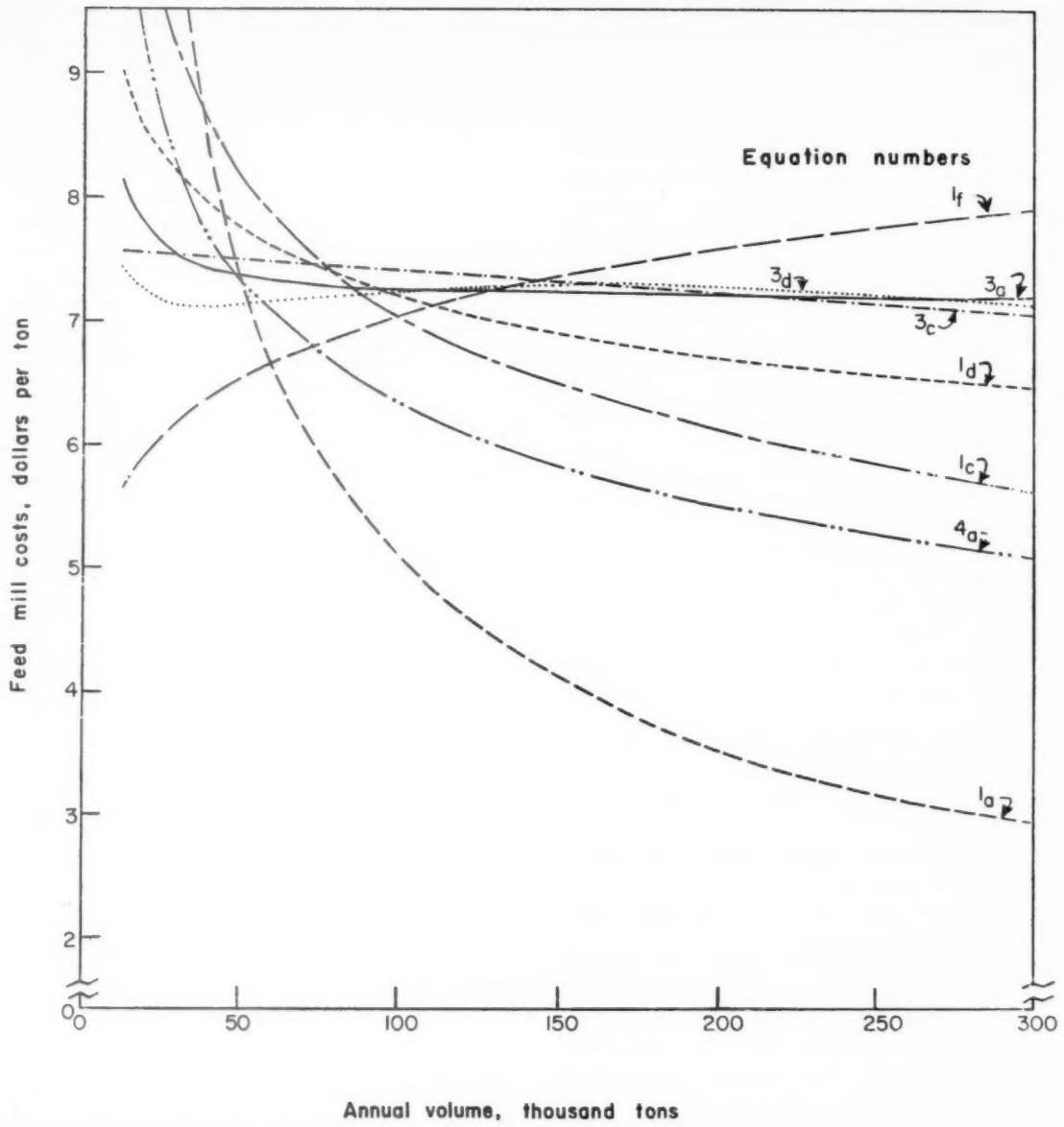

Figure 1. Estimates of economies of scale in feed milling, as derived from eight alternative cost models.

One may well wonder how such completely different results could be obtained from one set of basic data and still yield correlation coefficients and, for the most part, *t*-ratios which suggest high degrees of reliability. In part, this situation can be explained by the fact that changes in equation form were accompanied by compensating changes in the regression coefficients of the independent variables. For example, in the fitted equations for Model 1, there is a systematic inverse relationship between the exponent and multiplier of the volume variable. The changes in the estimated slopes of the regression surface which accompany changes in equation form apparently

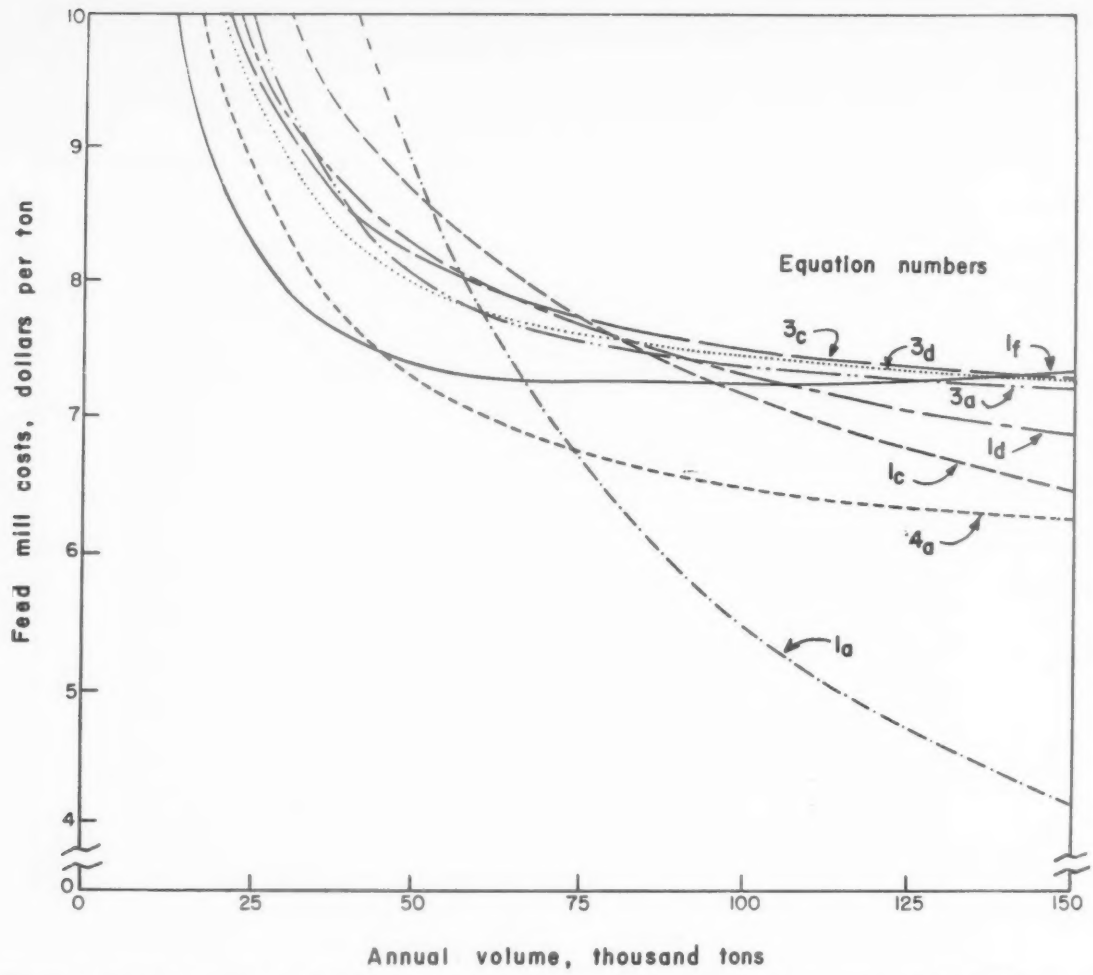

Figure 2. Estimates of short-run average costs for feed mills with annual capacities of 150,000 tons, as derived from eight alternative cost models.

take place in such a way that each of the alternative models fit the observed cost-volume points quite well. However, when these alternative slopes are projected to the long-run situation, the alternative models yield quite different results. The need for caution in projecting the results of any regression analysis is well recognized. However, use of cross-section data to estimate long-run costs will almost invariably involve some form of projection as firms are normally observed at some intermediate point on their short-run cost curves.

An inherent problem in projecting the results of any regression analysis is the lack of certainty that the true slopes of the regression surface have been detected. This lack of certainty prevails even when high multiple correlation coefficients are obtained if the independent variables are highly correlated with one another. In this analysis, the correlation between K and V was 0.856. Intercorrelation not only affects the reliability of the regression coefficients of a given equation but also permits regression surfaces with widely differing slopes in some directions to exhibit uniformly high multiple correlation coefficients.

Conclusions

We have presented the results obtained from the application of several alternative formulations or models of cost relationships. We stress that these formulations have not been selected at random—we are not attempting to demonstrate that a haphazard selection of type equations will yield a haphazard set of regressions. We submit that each general model used has substantial a priori backing; we note that, depending on the specific values obtained for the several regression coefficients, most of the forms used have produced plausible results at least over considerable ranges in volumes and capacities. In short, any one of these formulations might well have been selected by a researcher in attempting to derive quantitative cost functions from cross-section data drawn from a sample of operating plants. While obvious peculiarities in the results for some of the equations would have dictated their rejection, as noted earlier, most would have gratified the research worker by yielding highly "respectable" measures of correlation and of reliability. The individual results certainly seem to justify the assumption that each is a reasonably accurate and dependable description of the true cost functions.

Yet, the wide variety of cost relationships resulting from these trials throws an entirely different light on this matter. Our general conclusion must be that the analysis of such cross-section data may result in high correlations and apparently significant regression coefficients, without providing the basis for confidence in the results as even rough approximations of the basic cost relations involved. It is well recognized that the correlation coefficient is not an adequate guide in selecting among alternative regression forms, and our results emphasize that high and fairly uniform coefficients, plus regression coefficients which for the most part appear to be statistically significant, may be associated with entirely different estimates of the underlying cost functions.

To be specific with respect to this study of feed-mill costs, we are at a loss when faced with the problem of selecting among the several alternative formulations—although we would reject some and limit the range of applicability of others on logical grounds as noted earlier. We do not know whether long-run average costs levels are relatively high or low or if they are characterized by minor declines as scale is increased or by pronounced economies of scale extending over wide ranges in capacity. In a similar way, we find it impossible to forecast the effects of volume on costs for a plant of particular capacity. We would find it difficult or impossible to advise plant owners and managers as to the probable cost consequences of building larger or smaller plants or of combining the volumes for two or three plants in a single operation. Faced by this great diversity of empirical findings, we may well wonder if cost functions derived from cross-section data are fact or fantasy. While these conclusions stem specifically from the analysis of data from a small sample of feed mills, we know that essentially similar situations characterize many other types of marketing and processing plants. We find it difficult to believe, moreover, that the analysis of farm management cross-section data is devoid of such pitfalls.[7]

These somewhat doleful findings do not mean that studies of underlying industry economies of scale and short-run average cost curves based on cross-section data are without value, but they do emphasize that this approach should be used with care and caution. Perhaps, the following generalizations are justified:

1. The usual statistical tests of reliability and of correlation are of very limited usefulness in judging the significance of results as estimates of underlying relationships. The researcher must place primary dependence on a priori reasoning in selecting type equations and even then must be prepared to find that the empirical results are obviously unacceptable in certain ranges; by the same token but, unfortunately, less obvious, the derived relationships are suspect in all ranges as an indication of the underlying structure which determines plant costs.

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[7] This view is supported by the work of Hildebrand, John R., "Some Difficulties With Empirical Results From Whole-Farm Cobb-Douglas-Type Production Functions," *Journal of Farm Economics*, vol. XLII, November, 1960, pp. 897–904. This work examines the stability of estimated marginal productivities obtained by fitting alternative models to a single set of farm management cross-section data and fittings of the same model to data obtained in three successive years. Hildebrand concludes that ". . . it appears that one can hit on or select a particular model or application of a model to 'support' nearly any recommendation concerning resource use." p. 901.

2. Increasing the size of the sample may to some extent reduce the difficulties encountered in these trials, especially if plants in the sample cover wide ranges in both volume and capacity. It must be recognized, however, that the major problems stem from intercorrelation of the independent variables—here volume and capacity—and that this intercorrelation is not a function of sample size. If our sample plants cover wide ranges in volume for every level of capacity, say from 10 to 100 percent of available capacity, there will be a significant intercorrelation between volume and capacity variables, and this intercorrelation will increase as the sample covers wider and wider ranges in capacity.

3. The intercorrelation between volume and capacity permits compensating shifts in the regression coefficients for these variables; the coefficients are unstable and subject to fairly wide changes in response to chance differences in the plants included in the sample. In essence, these changes represent shifts in the estimates of the relative magnitudes of fixed and variable costs. As a consequence, cross-section data that separates fixed and variable cost components should permit greatly improved cost analyses although the relative levels of fixed and variable costs change markedly with differences in equipment and method.

4. With large samples, the data may be stratified and each stratum analyzed separately along lines similar to those employed for Equation 4a above. If we stratify by capacity, the observations within each stratum are more or less homogeneous with respect to plant size and each observation represents approximately the situation for a plant of this size when operated at the specified volume. Analysis of the strata data, then, should yield good approximations to the short-run cost functions which in turn are traces on the total cost surface.[8]

[8] Studies of cotton ginning costs by W. E. Paulson of the Texas Agricultural Experiment Station are good examples of the possibilities of deriving short-run or plant cost curves from sample strata homogeneous with respect to capacity and type of equipment.

5. As a corollary to (4), we join F. V. Waugh[9] in urging the advantages of graphic analysis or a combination of graphic and more formal methods. Plotting the observations for strata gives the researcher a "feeling" for his data, while visual inspection can be most helpful in selecting a specific equation form within any general a priori model. Moreover, this approach facilitates the use of envelope or near-envelope functions rather than average regressions—a real advantage in many studies.

6. None of the above comments refer to the basic data themselves other than with respect to such components as fixed and variable costs. Since the cost estimates result from accounting records, it is clearly desirable to have all data based on standardized and well-understood accounting systems. Estimates of fixed cost components should be based, ideally, on some standard such as new replacement values; failing this, approximate data on plant and equipment age might permit the inclusion of this factor directly in the analysis. Measures of capacity are especially useful in any attempt to derive both short- and long-run cost relationships, and direct observations of the capacities based on major equipment items should have been better, if available, than the estimates based on past performance used by Phillips. Because of the great importance of seasonal factors, capacity measurements in terms of rates (output per hours, and so on) will usually be most useful. Finally, information on total hours of plant operation may be a strategic addition to the data on plant volume. But these additions to basic information take us further and further away from usual cross-section data and into the area covered by the following paper in this series.

[9] F. V. Waugh, *Graphic Analysis in Agricultural Economics*, U.S. Department of Agriculture Handbook No. 128. Washington, 1957, p. 1.

Purchasing Power of Urban, Rural Nonfarm, and Rural Farm Income, 1955

By Horace L. Puterbaugh

Measures of per capita dollar incomes seem, at first hand, to be a good simple first approximation to obtaining some idea of the differences that exist between farmers' living standards and those of nonfarmers at any one point in time. But unfortunately, the following factors, among others, make the correspondence of income and living standards difficult: (1) The consideration of assets accumulated by both groups, (2) differences between farm and city "ways of life," (3) valuation problems with respect to dwellings, especially farm dwellings, (4) valuation of home-produced food and fuel consumed on the farm, and (5) differences between prices paid by farmers and nonfarmers for the goods and services they consume. This paper is addressed to item 5. In other words, after obtaining measures of income for both farm and nonfarm populations, and adjusting them for factors 1, 2, 3, and 4, is there left enough difference between the purchasing powers of such incomes to warrant a further adjustment in the basic income estimates to translate them into comparable measures of living standards? This is the question that the author of this article examines.

DIFFERENCES in the food purchasing power of incomes among urbanization groups, within particular regions, (Northeast, North Central, South, and West) is not great, if home-produced food is evaluated at retail prices. The method of evaluation used for home-produced food will influence greatly the purchasing power comparisons, since in the Household Consumption Survey of 1955, home-produced food as a percentage of total food consumed at home, varied from 2 percent in the urban Northeast to 47 percent in the rural farm South (table 3).

The greatest difference, as might be expected, was between urban and rural farm groups. Between rural nonfarm and rural farm groups the difference was relatively small. The latter comparison is of particular importance in view of the fact that the rural nonfarm group is increasing in size relative to the rural farm group and that farm-nonfarm income comparisons usually combine the rural nonfarm income with urban income to form the nonfarm total.

Fresh vegetables and fruit and vegetable juices tended to be slightly more expensive in the farm group than in the urban group. Presumably, this is because large quantities of these items are first transported to large city markets and then back to rural-area markets.

If the four regions are combined using population figures in the respective regions as weights, the overall food purchasing power is approximately 4 percent greater in the rural nonfarm than in the urban, 8 percent greater in the rural farm than in the urban, and 3 percent greater in the rural farm than in the rural nonfarm (table 1). Weighting the differences between rural farm and rural nonfarm (3 percent) and between rural farm and urban (8 percent) by population figures, the differential is approximately 6 percent greater food purchasing power in the farm sector than in the combined nonfarm sector for the United States as a whole.

With the differential in food purchasing power between the farm and nonfarm segments of the economy estimated at about 6 percent and the purchasing power differential of nonfood items (excluding medical care, housing, and clothing) estimated to be about 1 percent, a purchasing power approximately 2 or 3 percent higher for the farm segment as compared with the nonfarm segment is indicated for 1955. This overall estimate is based on weights developed from the 1955 relative importance of consumption items in the Consumers Price Index and in the Index of Prices Paid by Farmers.

TABLE 1.—*Food purchasing power comparisons of incomes by urbanization groups, incomes $0–$5,999, United States, 1955* [1]

Item	Percentage of urban expenditures	Percentage cost of urban budget in:		Percentage of rural nonfarm expenditures	Percentage cost of rural nonfarm budget in:		Percentage of rural farm expenditures	Percentage cost of rural farm budget in:	
		Rural nonfarm	Rural farm		Urban	Rural farm		Urban	Rural nonfarm
Milk, cream, ice cream, and cheese	15.202	93.4	93.4	15.485	106.7	100.8	19.463	105.9	98.8
Fats and oils	4.187	102.6	99.3	4.996	100.2	97.5	5.829	104.5	102.9
Flour and other cereal products	3.463	100.9	97.2	5.134	102.6	98.6	6.180	107.8	104.5
Bakery products	7.274	99.2	96.6	6.867	101.2	97.8	4.667	103.5	103.2
Meat, poultry, and fish	33.681	94.1	89.1	29.881	106.1	94.3	27.899	112.7	106.8
Eggs	4.179	91.1	81.3	4.427	109.7	89.7	4.488	123.4	113.2
Sugar, sweets	2.972	98.4	93.5	4.030	100.2	94.0	4.429	107.0	109.7
Potatoes and sweetpotatoes	2.111	94.0	91.0	2.486	107.6	99.6	2.396	108.4	99.9
Fresh vegetables	5.718	104.9	102.8	5.915	96.6	100.8	6.875	97.1	98.8
Fresh fruits	4.679	91.8	86.4	4.949	110.9	96.8	5.189	118.4	105.3
Commercial frozen fruits and vegetables	.855	100.6	99.9	.629	97.9	93.6	.201	111.9	110.7
Commercial canned fruits and vegetables	3.680	99.0	98.1	3.277	101.1	98.8	2.226	100.9	99.9
Fruit and vegetable juices	1.497	108.5	104.9	1.166	101.7	105.0	.821	96.6	96.0
Dried fruits and vegetables	.489	107.7	95.3	.779	97.9	91.5	1.165	104.7	109.0
Beverages (nonalcoholic)	5.655	100.6	99.0	5.840	100.1	99.4	4.920	101.8	102.8
Miscellaneous foods	4.358	95.3	89.5	4.139	108.4	98.7	3.252	110.8	105.2
Total	100.000			100.000			100.000		
Weighted average		96.4	92.8		104.4	97.1		108.4	103.9
Reciprocal of weighted average		103.7	107.8		95.8	103.0		92.3	96.2

[1] Regional figures weighted by population in each region.

No attempt was made in this study to relate price with quantities purchased. Since families are somewhat larger in rural than in urban areas, it is possible that purchases are made in larger quantities in the rural areas. If larger quantities are bought at lower prices, this would tend to reduce the indicated price differential between urban and rural urbanization groups.

If the results of this study are used to develop a purchasing power adjustment factor to be applied to ratios of incomes among the various urbanization groups, care must be taken to insure comparability between procedures used for treating nonpurchased food in this study and in the income ratio calculation. For example, agricultural income would need to include nonpurchased food valued at retail prices.

Data and Method

Purchasing power comparisons can never be precise comparisons of the relative satisfactions that may be obtained from particular incomes. Some of the basic reasons for this inadequacy are as follows:

First, there are psychological and cultural differences in the people themselves. Particular occupational groups have particular needs and desires. Therefore, an article, or class of articles, in one group may be of considerable importance to that group but totally irrelevant to another.

Second, the measurement prerequisite of a comparable list of items purchased by all of the groups under study for making direct price comparisons is never exactly fulfilled. There are always grade differences of one form or another, as well as differences in the relative quantities purchased.

Third, there is the problem of weighting the individual items to obtain a single index measure of purchasing power for each group. Should the prices be weighted by quantities purchased in area A or area B; or should a type of formula cross be used as in the "Fisher Ideal" index formula?

TABLE 2.—*Value of food consumed as a percentage of income after taxes, families of two or more persons, incomes $0 to $5,999, 1955*

Region	Urban	Rural nonfarm	Rural farm
	Percent	*Percent*	*Percent*
Northeast	42.5	38.9	49.8
North Central	39.1	39.2	44.8
South	40.5	46.2	57.8
West	37.4	43.2	51.0
United States	40.4	42.0	51.1

TABLE 3.—*Nonpurchased food as a percentage of total food consumed at home, by regions and urbanization groups, 1955*

Region	Urban	Rural nonfarm	Rural farm
	Percent	*Percent*	*Percent*
Northeast	2.0	10.5	43.1
North Central	3.0	11.5	43.1
South	5.0	17.4	47.2
West	3.9	8.9	35.6

The measure used in this study of purchasing power was the reciprocal of the cost of consumption items actually purchased by one group relative to the cost of the same items if they had been purchased by another group.[1] Thus, for any two groups compared, two different measures were computed—the reciprocal of the percentage cost of the budget of area A if purchased in area B, and the reciprocal of the percentage cost of the budget of area B, if purchased in area A.

These two values are not necessarily extremes that bracket any "true value" of relative purchasing power. However, they are two very useful values. To the extent that the budgets (quantities and qualities) in the three urbanization groups—urban, rural nonfarm, and rural farm—are similar, the two values calculated do reflect a true value of relative purchasing power. A geometric mean of these two values would be equivalent to a "Fisher Ideal" index number.

[1] This measurement technique is the same as that used by Nathan Koffsky in his article, "Farm and Urban Purchasing Power," published by the National Bureau of Economic Research in Volume 11 of *Studies in Income and Wealth*, 1949.

Food is the most important single item consumed by households. Since data were available in detail for this consumption item, a detailed analysis was made of the differences in the purchasing power of incomes in terms of food by urbanization groups within regions. For selected nonfood items, a similar analysis on a national basis was made between all nonfarm and farm groups.

The percentage that the value of food consumed was of incomes (after taxes and including nonpurchased food valued at retail) for families of two or more persons with incomes from $0 to $5,999, by regions and urbanization groups, is shown in table 2.

Variations in the proportions of nonpurchased food to total food consumed at home, by regions and urbanization groups, are shown in table 3.

In addition to the usual comparison between urban and farm segments, comparisons with the rural nonfarm segments are also analyzed, since this segment of population constitutes a significant proportion of the total population (table 4).

Data for the food portion of the study was obtained from published reports 1, 2, 3, 4 and 5 of the Household Food Consumption Survey of 1955. Report no. 1 was the United States report, while reports 2, 3, 4, and 5 were food consumption reports for the Northeast, North Central States, South, and West. Certain characteristics of this survey were of importance in this study of purchasing power.

1. The Census of Agriculture definitions of urban, rural nonfarm, and rural farm were used. *Urban* households lived in communities of 2,500 or more persons or in the fringe areas around

TABLE 4.—*Rural and urban population by regions, 1950* [1]

[In thousands]

Region	Urban	Rural		
		Total	Nonfarm	Farm
North Central	28,491	15,970	8,537	7,432
Northeast	31,374	8,105	6,314	1,791
South	22,961	24,241	12,345	11,896
West	13,648	5,914	3,985	1,929
Total	96,474	54,230	31,181	23,048

[1] Source: Statistical Abstract of the United States, 1959.

cities of 50,000 or more. *Farm* households were those that included a farm operator, a person responsible for the operation of a farm, either performing the labor himself or directly supervising it. A farm was defined as in the 1954 U.S. Census of Agriculture, that is, a place of three or more acres with value of farm products raised (for sale or for home use exclusive of home gardens) amounting to $150 or more in 1954, or a place of less than three acres with value of sales of agricultural products amounting to $150 or more. Those few farm households that lived in urban places were tabulated as urban schedules. *Rural nonfarm* households were those living outside urban places that were not classified as rural farm.

2. Food quantities and values were based on *food consumed* (not purchased) at home by households in one week during April to June, 1955.

3. Home-produced food was valued at prices reported by households in the same region and urbanization group purchasing a similar item.

For this food purchasing power study, only selected groups within the larger study group were considered. This selection was based on the following criteria:

1. Income groups from $0 to $5,999 *after taxes* were combined. This combination seemed essential to give a broad base to the study. The base was not so broad, however, as to include a large number of households with incomes so high that a distortion would be created by large expenditures for luxury food items at excessively high prices.

2. Only households of two or more persons were considered.

3. Food items not consumed in all three urbanization classifications, within a given region, were excluded from the analysis. Hence, the number of food items analyzed varies slightly from region to region as follows:

Northeast	North Central	South	West
214	219	214	211

This detailed list of food items was aggregated into the 16 major food groupings presented in the following analytical section. Within each major grouping, price relatives and the weighting of such relatives were based on the detailed breakdown.

Some differences in the composition of the food budget occur between urbanization groups within each region. These differences, however, are not extreme. The percentage of the total food budget expended on any one item seems to be remarkably stable.

Data for the nonfood portion of this study was limited. A sample of 17 items was taken from the Index of Prices Paid by Farmers and the Consumers Price Index. This was believed to be the extent to which nonfood items included in the two indexes could be considered comparable.

Regional Comparisons [2]

Northeast

The Northeast Region is the smallest contributor of the four regions to total agricultural output; it accounts for only 9 percent of the total cash receipts from farm marketings in 1955. Only 15 percent of the total United States rural population lived in the Northeast in 1955, and of that rural population, only 22 percent was rural farm population.

Five food items in the urban food budget would have cost more if purchased at prices prevailing for the rural nonfarm group, and three items would have cost more at prices prevailing for the rural farm group.

The cost of the entire food budget for the urban group would have been about 93 percent of its urban cost if purchased at prevailing prices for the rural farm group and about 95 percent if purchased at prevailing prices for the rural nonfarm group. Conversely, the cost of the rural farm budget would have been 108 percent of its actual cost at prices for the urban group and 103 percent if purchased at levels prevailing for the rural nonfarm group.

In general, differences in food purchasing power of incomes between the urbanization groups were small, the food purchasing power of the rural farm group was slightly larger.

North Central

The North Central region contains 32 percent

[2] Statistical tables indicating food purchasing power comparisons by each of the four regions—Northeast, North Central, South, and West—analogous to table 1 are available from the Economic Statistical and Analysis Division of the Economic Research Service.

of the total United States farm population, and cash receipts from farm marketings in 1955 were 43 percent of the United States total. The agricultural importance of this region, which contains the Corn Belt and a great share of the Wheat Belt, lends significance to the food purchasing power comparisons of urbanization groups within this region.

Meat, poultry, and fish were by far the most important items tending to widen the gap between urban and rural farm food purchasing power. As they constitute nearly a third of the urban food budget, these items would have amounted to 84 percent of its actual cost if purchased at prices prevailing for the rural farm group. The rural farm group spent nearly as great a share of its food budget for these items; at prices prevailing for the urban area, their cost would have been 120 percent of actual cost.

Milk products, which constitute 15 percent of the urban food budget and 19 percent of the rural farm budget, would have cost the urban group about 6 percent less and the rural farm group about 13 percent more, if they had been purchased at prices paid by opposite groups.

In each of the three urbanization groups studied, at least 6 of the 16 major food items could have been purchased at less cost if purchased at prices prevailing for another urbanization group. Ninety-two percent of the urban budget could have been purchased at less cost at prices paid by the rural nonfarm group and 94 percent at less cost at prices paid by the rural farm group. Only 5 percent of the rural nonfarm budget could have been purchased at less cost at prices prevailing in the urban group, while 66 percent could have been purchased at less cost at prices prevailing for the rural farm group. A reduction in the cost of the rural farm budget could have been achieved in only 1 percent of the budget if purchased at prices paid by the urban group, but in 38 percent of the budget if purchased at prices prevailing for the rural nonfarm group.

As might be anticipated, food costs tended to be farther apart between the urban and rural farm groups. The urban budget could have been puchased for 90 percent of its cost if bought at prices prevailing for the rural farm group and the rural farm budget would have cost 113 percent of its actual cost at prevailing prices for the urban group. On the other hand, the rural nonfarm budget would have cost 96 percent of its actual cost at prices paid by the rural farm group and the rural farm budget could have been purchased for 104 percent if bought at prices paid by the rural nonfarm group.

South

The Southern Region, containing 40 percent of the farm population and 45 percent of the total rural population of the United States, contributed only 30 percent to the total cash receipts from farm marketings in 1955. Its characterization as the low-income area of agriculture is sustained by the fact that in the income group analyzed for this region households of 2 or more persons with incomes from $0 to $5,999 contained a higher proportion of all 2-or-more person households than any other region studied—78 percent of the urban, 86 percent of the rural nonfarm, and 84 percent of the rural farm.

Meat, poultry, and fish accounted for most of the higher food purchasing power of rural farm incomes compared with urban incomes. Fresh vegetables, commercially canned fruits and vegetables, and fruit and vegetable juices, were approximately 6 to 7 percent more expensive in the rural farm group than in the urban group. As in all regions, eggs were purchased at considerably less cost by the rural farm group than by any other group; however, this item accounted for only about 5 percent of the food budget in each of the three urbanization groups in the South.

In each of the three urbanization groups, at least 6 of the 16 major food items could have been purchased at less cost if bought at prices prevailing for other urbanization groups.

However, the difference in food costs in urban compared with rural nonfarm groups was extremely small. The urban budget would have cost the same if purchased at prices paid by the rural nonfarm group and the rural nonfarm budget would have cost 102 percent of its actual cost if purchased at prices paid by the urban group.

A slightly greater difference was obtained between the rural nonfarm and the rural farm group; the two measures were 97 and 104 percent, with food costs less for the rural farm group. The urban and rural farm groups indicated the greatest difference in food costs—the percentage cost of the urban budget if purchased at prices prevailing for the rural farm group was 96 per-

cent and the percentage cost of the rural farm budget at prices prevailing for the urban group was 106 percent.

West

The West contributed 19 percent to total United States cash receipts from farm marketings in 1955. Of this 19 percent, California contributed 9 percent—nearly half of the total farm cash receipts in the West.

Only 11 percent of the United States rural population was in the West. Within this rural population, 33 percent was rural farm population.

Meat, poultry, and fish were responsible for most of the food cost difference in the West. This was because of the large part of the food budget consisting of this item—more than 30 percent in each of the three urbanization groups.

The urban food budget could have been purchased for 99 percent of its actual cost if purchased at prices paid by the rural nonfarm group and for 94 percent of actual cost at prices paid by the rural farm group.

The rural nonfarm budget would have cost 104 and 95 percent of its actual cost if purchased at prices paid by the urban and rural farm groups, respectively.

The rural farm budget was more expensive when priced at prevailing prices for each of the other two urbanization groups—the percentages of its actual cost were 110 and 105 percent at prices paid by the urban and rural nonfarm groups, respectively.

Nonfood Items

Food was by far the greater expenditure item for the income group $0–$5,999 examined in the study. To learn whether the purchasing power differentials obtained for food were typical of those for other items in the consumer budget, a sample of 17 items was taken from items in the Index of Prices Paid by Farmers and the Consumers Price Index (table 5). This sample excluded medical care, housing, and clothing. It was believed that differences in quality between the various urbanization groups for these consumption items was so great as to make direct price comparisons of specific articles of little value. The 17-item sample was assumed to be representative of all consumption items not otherwise accounted for—approximately 20 percent of the total consumer budget in both the farm and nonfarm group. It was assumed that prices of articles in the Index of Prices Paid by Farmers and the Consumers Price Index represented prices in the farm and nonfarm groups, respectively.

TABLE 5.—*Price comparisons of selected items from the Index of Prices Paid by Farmers and the Consumer Price Index, 1955*

Item	Price relatives		Percentage importance in index	
	Prices pd./ CPI	CPI/ Prices pd.	Prices pd.[1]	CPI
	(1)	(2)	(3)	(4)
Sheets	108. 5	92. 2	0. 378	0. 192
Blankets, wool	78. 0	128. 2	. 109	. 090
Turkish towels	67. 0	149. 2	. 101	. 066
Living room suites	107. 7	92. 8	. 680	. 518
Bedroom suites	69. 4	144. 0	. 428	. 488
Mattresses, innerspring	104. 0	96. 2	. 202	. 222
Refrigerators, electric	109. 3	91. 5	. 622	. 763
Vacuum cleaners	87. 1	114. 8	. 092	. 209
Sewing machines, electric	88. 1	113. 6	. 126	. 173
Curtains	54. 6	182. 6	. 227	. 156
Rugs, Axminster 9′ x 12′	90. 8	110. 2	. 420	. 358
Washing machines, electric	117. 0	85. 4	. 588	. 488
Coal, bituminous	103. 7	96. 4	1. 133	. 528
Coal, anthracite	121. 9	82. 1	. 684	. 242
Electricity	100. 0	100. 0	. 957	1. 022
Auto tires	98. 6	101. 4	. 638	. 349
Gasoline	100. 0	100. 0	4. 380	2. 402
Total			11. 765	8. 266

[1] Adjusted to compensate for production items in the index.

Source: *Agricultural Prices*, January 15, 1956, and *Average Retail Prices, 1955*, Bureau of Labor Statistics Bulletin No. 1197.

Percentage cost of the farm budget if purchased at prices prevailing for the urban group (weighted average of col. 2; weighted by col. 3)—101.3. Percentage cost of urban budget if purchased at prices prevailing for the farm group (weighted average of col. 1; weighted by col. 4)—99.3.

Although this sample was limited, it indicated roughly that purchasing power differentials are greater in the food portion of the budget than in the nonfood portion. The percentage cost of the nonfood items in the farm budget (Index of Prices Paid by Farmers) priced at prices paid by the nonfarm group (Consumer Price Index) was 101 percent and the percentage cost of the nonfood items priced at prices paid by the farm group was 99 percent. It was assumed that price differences in medical care, housing, and clothing resulted from differences in quality. These results suggest very little difference in the purchasing power of farm income versus nonfarm income with respect to comparable nonfood items.

BOOK REVIEWS

Investment Policy and Investment Legislation in Under-Developed Countries. By Reinhard Kovary. Rangoon University Press, Rangoon. (Distributed in the United States by Taplinger Publishing Co., New York, N.Y.) 124 pages. 1960. $2.00. *Agricultural Credit in Economically Underdeveloped Countries.* By Horace Belshaw. Food and Agriculture Organization of the United Nations, Rome. (Distributed in the United States by Columbia University Press, New York, N.Y.) 255 pages. 1959. $3.50.

ESTABLISHING NEW INDUSTRY and strengthening agriculture are often prerequisites to economic growth and higher levels of living in underdeveloped countries of the world. These two reports discuss different aspects of capital investment as a key need in meeting these objectives. Reinhard Kovary is primarily concerned with accelerating foreign investment in new businesses through better legislation. Horace Belshaw deals with improving credit conditions within countries with the main objective to increase agricultural output and to raise living levels of rural people.

Mr. Kovary speaks from the background of his experience as a United Nations advisor to the government of Burma. He concludes that a statement of policy simply inviting foreign investment will not attract much capital. In recent years, nationalization has brought too heavy losses to investors. The author suggests the greater security of specific legislation, which can be amended only with the consent of proper constitutional authorities, not at the whim of the current executive.

He suggests that the proposed legislation should leave very little to the interpretation of administrators. Incentives and privileges offered investors, as well as conditions they must meet, should be spelled out in detail. Sound government procedures and qualified personnel to administer the legislation are important also.

The legislative and administrative proposals of Kovary may facilitate investment in those countries where governments are stable and public sentiment is favorable to foreign interests. But even stronger guarantees appear to be needed in many countries, particularly for major capital expenditures that will pay out only in the long run.

Many students of this problem believe that private capital could be attracted more readily were repayment promises strengthened by some international organization. The author's passing reference to an international convention for the protection of private property rights deserves further exploration. Some such way of reducing or spreading risks is needed before private investors can be expected to help materially in economic development. But there is a more serious omission. Mr. Kovary fails to discuss how the governments of more prosperous nations, either singly or through international cooperation, can assist in the capitalization problems of underdeveloped countries. The Export-Import Bank of the United States and the World Bank, for example, already have accumulated much experience in developmental credit programs.

Horace Belshaw, a New Zealand economist who was formerly with the Food and Agriculture Organization of the United Nations, has had a lifetime interest in agricultural credit. The main

focus in his book is on improved credit for agriculture, but he recognizes it as only one need in achieving increased farm output and higher incomes for rural people in underdeveloped countries. He speaks of supporting investments in "social overhead" such as in irrigation, highways, storage, marketing facilities, and the need for tax and land reforms and improved education. Success in agriculture also depends upon a favorable general climate, including development programs in other sectors of the economy.

Suggestions relative to credit include improvements in the supply of funds, in lending conditions, in lending institutions, and in how credit is used by farmers. The author's general thesis is that agricultural credit in most underdeveloped countries needs to be made more "dynamic" so as to contribute to a net increase in output, income, and assets. At present, too much credit is "static." The amounts available and the way in which credit is used do not permit any increase in productive capacity or efficiency.

Belshaw places considerable emphasis on changing the reluctance of peasant farmers to adopt new lines or methods of production and to borrow for capital investment. He believes that farm investments designed to utilize labor more fully should have first priority and that technology should be kept simple and within the competence of the farmer. Assistance in applying new techniques and improving farm management should often be integrated with credit. These considerations are as important as increasing the supply of credit, lowering its costs, and improving credit terms and conditions.

In recommending supervised credit, he cites the pioneering experience of the Farmers Home Administration in the United States. Success of less well-educated, undercapitalized peasants depends upon combining farm and home education with credit. Belshaw suggests that lenders might be reimbursed by the government for costs of supervision, because this is a social responsibility similar to extension education in the United States. Interest charges might reflect direct loan costs only. A limited number of families could be helped at any one time, but as their conditions improved, the program would be transferred to others.

Belshaw admits that many cooperative ventures in underdeveloped countries have failed, but he believes that they have potential social and economic advantages as instruments in implementing agricultural credit programs. Not only can they encourage thrift and build up savings in farm communities, but they also constitute a means of dealing with credit, marketing, and supply problems in combination. He recommends providing a stronger foundation for cooperatives as a way of promoting mutual help among farmers.

He points out that a central banking system promotes economic growth in all segments of an economy. It helps to establish and strengthen commercial banking facilities and agricultural credit institutions. It supervises financial agencies and provides technical help in banking principles and procedures. By developing better credit instruments and cheaper systems of remittances, it also can improve business and marketing transactions.

Little fault can be found with Belshaw's report. His philosophy with respect to functions and use of credit to achieve productivity in agriculture is in harmony with the thinking of recognized agricultural economists. He knows that governments, rather than private groups, must promote the major breakthrough and actively initiate programs. They must establish a favorable overall climate and participate in the advancement of farm production and marketing techniques. Governments must regulate the activities of merchants and moneylenders and establish new credit institutions. Governmental loans or other financial assistance also will need to be given to farmers or lending agencies. Methods for doing the job differ from those appropriate in more highly developed nations, but Belshaw shows how it can be done without straying from the basic principles of private enterprise.

These two books are valuable complementary references to those who seek remedies for the sick economies of underdeveloped countries. Kovary suggests better legislation as a way of attracting outside capital, especially for industrialization, to improve the overall health of countries. Belshaw discusses how nations can marshal internal resources for the main objective of developing sound agriculture and improving rural living conditions. Even countries with limited areas of backward farming, such as the United States, may have something to learn from these reports.

Lawrence A. Jones

Futures Trading Seminar—History and Development. Principal Papers by Henry H. Bakken, Roger W. Gray, Thomas A. Hieronymus, and Allen B. Paul. Mimir Publishers, Inc., Madison, Wisconsin. 283 pages. 1960.

WHO WILL BUILD the bridges to span the growing gap between theory and business practice? What will strengthen the thin lines of communication between the economist and the businessman? Here is one answer—and one bridge.

The Chicago Board of Trade, through its Educational Advisory Committee, planned and conducted the seminar reported in this volume. The program included four main speakers, 12 formal discussants, and 25 other seminar participants. Each main paper was prepared by a competent professional economist in the field, and each was subjected to the crossfire of a team of three discussants consisting of a business representative and two economists.

The 25 other participants were about equally divided between the business and academic worlds. In terms of printed pages, the main papers took 50 percent, formal discussions 30 percent, and general discussion 20 percent of the total time.

The seminar was designed to assess the role and function of the futures markets and to focus on extending the boundaries of knowledge and opening up areas of pioneering research. The four main papers are addressed to four areas of study: (1) A historical evaluation of the role and function of futures trading. (2) The importance and effectiveness of hedging. (3) The effects of futures trading on prices. (4) The future of futures trading.

Henry Bakken's engaging prose traces the development of futures trading from its medieval origins when "the tempo of trade was geared to the cadence of the camel and the speed of the sail," through the fairs of Champagne, down to modern times and the intriguing conception of a universal contract that may some day disengage futures trading from its ties to specific commodities. The right of delivery of a particular commodity is seen as "a vestigial remnant of an age-old custom, a slender strand of gossamer that is easily severed . . ." A universal contract would take the place of many commodity contracts tied to specific commodities. Under this concept, one would really engage in trading on the basis of index numbers.

Roger Gray brings new insight to the old subject of hedging, both in his analytical review of conventional evidence of the importance of hedging and in his pioneering statistical attempt to appraise futures markets in terms of their effectiveness for hedging purposes. He concludes that futures trading depends upon hedging and is impaired by any outside factor that reduces the need for hedging. A further chronic threat to futures trading is lack of understanding of the more subtle point that effectiveness for hedging depends upon speculation.

Professor Hieronymus diligently pursues the ancient dragon of speculation through a descriptive analysis of its pricing functions, a general theory of the influence of speculation on prices, and a system for the empirical analysis of the speculative influence. His general conclusion is that both theoretical and empirical considerations suggest that variation in prices is reduced by an active futures market. His empirical analysis of onion futures is of special interest.

Allen B. Paul and William T. Wesson's careful analysis of the future of futures is divided roughly into three parts—the nature of futures trading, basic tendencies in market organization, and the bearing of structural changes on futures trading. The most illuminating part is that dealing with the nature of futures trading. The theoretical concept involved may well prove to be one of the most fruitful to be advanced since Henry C. Emery's classic statement of 1896, which centered mainly around the elimination of price risks.

This new alternative concept was first developed several years ago in a Brookings Institution study under the leadership of Harold B. Rowe. The general idea is that futures trading is one of the many financial institutions in a well developed exchange economy. It facilitates equity investment in commodities. The speculator is seen as an important financier who commits his assets to commodity futures and influences the cost of carrying. A futures contract is a forward commitment, and any forward commitment results in a

genuine investment of capital in commodities, even though no funds pass directly from the forward buyer into the commodity business. This view does not say that the older theories are wrong; it says only that the former angle of vision did not place the whole complex in the best perspective.

The Futures Trading Seminar is a model for a well-planned and well-conducted seminar involving competent economists and businessmen in the right proportions for stimulating discussion. If it solves few problems, it does bring new vision and new hope to guide the weary traveler on the frontiers of knowledge. It will be especially useful to researchers, teachers, and people in the trade who are interested in exploring new analytical paths.

Ronald L. Migbell

Modern Elementary Statistics. Second Edition. By John E. Freund. Prentice-Hall, Inc., Englewood Cliffs, New Jersey. 413 pages. 1960. $9.00.

WRITTEN FOR BEGINNING students in the natural and social sciences, this book's approach to elementary statistics is based on the precept that "statistical concepts and statistical methods are nothing but a refinement of everyday thinking." Some statisticians may decry this description of their field as a gross oversimplification, but it is a good approach to use for students with nonmathematical backgrounds.

This second edition of Freund's nontechnical elementary statistics text has been considerably revised, updated, and expanded. For instance, there is increased emphasis on statistical inference, with three chapters on tests of hypotheses, including one on nonparametric tests. Also, the symbolism has been changed to correspond with that now in generally accepted usage.

Starting with descriptive methods, such as frequency distributions, measures of location, and variation, the book continues with probability, estimation and tests of hypotheses, and concludes with a section on regression, correlation and time series. The treatment of these subjects is adequate but not rigorous.

The author aims at imparting an understanding of statistical concepts rather than the rote memorization and manipulation of formulas, so derivations and proofs are often omitted. Annotated bibliographies at the end of chapters provide the student with sources for proofs and greater detail on the subjects covered in the text. A good knowledge of high school algebra is all the mathematics needed to understand the text and to work the exercises. The problems supplement the text without requiring a greater knowledge of statistics than what has been covered previously, and they are widely drawn from the various fields of application.

This is an excellent text for use in an introductory course in statistics for students with limited mathematical training. A reader who has had some algebra and who wishes to become acquainted with statistical methods and concepts should gain considerable insight from it. Those fortunate enough to have a more extensive mathematical background would perhaps prefer a more rigorous derivation of formulas, though they too could profit from Freund's lucid presentation of statistical concepts.

Arthur A. Harlow

Wholesaling in Marketing Organization. By David A. Revzan. John Wiley & Sons, New York. 656 pages. 1961. $10.50.

A BROAD GAUGED BOOK on wholesaling, Professor Revzan's work covers the marketing system, the place of wholesalers in it, and deals with internal operations of a wholesale firm as well as the problems and policy considerations involved in running it. In treatment, it is related to an earlier institutional approach to marketing developed by Revzan and Duddy. Little has been written on wholesaling in the United States; this new work is designed to fill a real need. The importance of wholesaling functions as stressed by the author, is well taken. The material in this work, which is concerned with internal operations, includes comprehensive discussions on merchandising, buying and price policies, as well as management's tools for coordination and control.

Two chapters are devoted to a discussion and

critique of Government regulations as they affect marketing, with special emphasis on the Robinson-Patman Act. Though the general account of Government regulatory activities is orderly and comprehensive, it is also critical. Government as a countervailing power, capable of operating in the public interest against the power of big business operating in its self-interest, is ignored. Many of the shortcomings Professor Revzan notes are more a result of business seeking to circumvent the letter and the spirit of the law than of shortcomings in the legislation. He fails to place the regulatory activities in proper perspective against the broad spectrum of Government programs that affect marketing firms and the marketing process. Only one paragraph in the two chapters is devoted to "Government research activities."

The author's comments suggest that he is not so well grounded in agricultural marketing as in other fields. He fails to note research reports on operations of food wholesalers or on wholesale-retail trade relations published by the U.S. Department of Agriculture during the last decade. Indeed, he seems not to be cognizant of the recent revolution in relations between food retailers and wholesale suppliers, and but vaguely aware of the implications for wholesaling organization and internal operations. The significance of this new approach to service wholesaling for industries other than food is overlooked.

The author is at his best in his systematic conceptualization of the overall marketing organization. His description of the forms and functions of wholesale institutions is excellent. But the book is not easy to read. It is unduly wordy in many parts; and it repeats referrals to points or considerations raised in earlier sections. Despite the pedestrian writing of the work, the countless bogs that slow down reading progress, a student of marketing who plods through the 600 pages will be rewarded with a comprehensive account of wholesaling.

Martin Kriesberg

Marketing in Latin America. By Frank Montgomery Dunbaugh. Printers' Ink Book Co., New York. 298 pages. 1960. $7.50.

MARKETING IN LATIN AMERICA was written for executives and students seeking an insight into marketing in that part of the world. One finds insight in the vivid descriptions of the relevant Latin American culture, current trends in marketing, and such specific aspects of marketing as distribution, marketing research, advertising, public relations, business practices, legal aspects, and licensing (production of patented or trade-marked goods under license). Case histories of successful operations deal with marketing of capital goods, consumer goods, and services.

Agriculturally oriented subjects are referred to sporadically. In scanning the index, one sees the names of three farm-equipment firms and seven firms that market food products, soaps, and so on. Rolled oats, dried milk, soup, coffee, and beer are mentioned when companies handling them illustrate a point, or as some feature of the Latin American market is described.

A 55-page "economic picture of Latin America" is a useful feature of the book. It describes Latin America as a whole and each of the 20 countries. For each country, one finds such elementary facts as areas and populations; such data of marketing significance as names of newspapers, radio and TV stations, and shipping firms and airlines; and concise descriptions of economic activities.

The jacket warns that the book is "not directed toward academicians." Nor should one expect to learn here about the primary markets for agricultural commodities in Latin America. On the other hand, marketing in Latin America inevitably reflects agriculture's substantial contribution to gross national product, which makes the book more significant for agricultural readers than the author may have intended. And agricultural economists, like younger executives and students, may have some use for insight into the business of marketing south of the border.

Louis F. Herrmann

Mechanization in Agriculture. J. L. Meij, Editor. Quadrangle Books, Chicago. 380 pages. 1960. $7.24

MECHANIZATION in agriculture, which has received much research attention in recent years, is discussed in this volume by nine authors, eight of whom are English or Dutch. One of a series on industrial economics, the book has as its stated purpose "to stimulate study and research in this part of economics, and to further an interchange of ideas and results on an international basis."

The nine authors vary widely in their approach and treatment. A Professor of Agrarian History from the Netherlands, for example, presents a wealth of historical facts on farm mechanization, going back to 2,000 B.C., although he fails to bring his history up to date—many of his statistics are no more recent than 1900 or 1910, leaving out the period since, during which advances in mechanization have been rapid. Along with the wealth of facts, the author presents interpretations, some of which seem inadequate. For example, in explaining the increase in mechanization over time, little emphasis is given to the effects of rising farm wages. The chapter contains a bibliography of 101 references on the history of farm mechanization, nearly all from Western Europe and the United States.

Chapter 2, written by an English agricultural engineer, and chapter 3, by an American agricultural economist, deal with the development of farm mechanization in Europe and the United States. These are rather good treatments, bringing out basic principles and the problem of fitting machinery into the farm business. Chapters 4 and 5, written by an English engineer and an English economist, deal mainly with the farm management aspects of mechanization and duplicate in considerable degree the material in chapters 2 and 3. Another chapter, concerned with financing mechanization, is a fairly comprehensive treatise on the general problem of farm finance. It is an adequate treatment, but most of it applies to general farm finance rather than to machinery as such.

Mechanization of the small farm is the subject of another chapter. Here the analysis is entirely in terms of conditions in Western Europe, particularly the Netherlands, where farms are typically small. The results do not seem to apply widely to the numerous areas in which farms are much larger and where, frequently, there is a pronounced upward trend in size of farm.

Other chapters deal with mechanization and marketing organizations and with comparisons between industrial and agricultural mechanization. These are high-caliber general treatments and widely applicable. The chapter on mechanization and marketing is much broader than its title indicates. It deals with production as well as marketing, and, at times, with the whole field of technology in agriculture rather than mechanization alone. The comparison of industrial and agricultural mechanization is nicely done, with pertinent data from many countries, including Canada, the United States, and Russia.

Several chapters are real contributions and would stand well as individual articles. But the book as a whole suffers from lack of central purpose and coordination. Some of the material applies only to specific area situations, such as Western Europe, though this is not always obvious. The statistics in some tables do not have adequate headings; others are presented in terms that will not be easily understood by most readers in this country. A few of the chapter headings are not consistent with the material in the chapters. To younger readers, and those who have only a general interest in the subject, the book could be confusing. More mature readers, however, are likely to find certain chapters of real value, particularly if they are interested in such problems as the mechanization of small farms in Western Europe.

Merton S. Parsons

Free Grass to Fences; The Montana Cattle Range Story. By Robert H. Fletcher. Published for the History Society of Montana by University Publishers, New York. 235 pages. 1960. $12.00.

OVER THE YEARS, the range cattle industry has had as great a romantic appeal to the American people as anything in our history. The author of this volume, assisted by the Montana Stockgrowers Association and the Historical Society of Montana, brings to life the individual stockmen of early Montana. Many of the sketches done by the great cowboy artist, Charles M. Russell, are reproduced. These add to the attractiveness of the book.

An economic study of the Montana range cattle industry was made in the 1920's by Robert S. Fletcher of the Bureau of Agricultural Economics. The results of the study were published as articles and as a bulletin by Montana State College. The present book, by Robert H. Fletcher, provides, in contrast, a narrative account of the growth of the industry and of the development of the Montana Stockgrowers Association.

The first cattle were probably brought into Montana by fur traders, but it was not until migration began over the Oregon Trail and other roads that a cash market for livestock developed. The local market increased tremendously with the discovery of gold and the movement of miners into the area.

Many of Montana's early ranchers entered the territory with their herds in the 1860's and 1870's. During the next few years, the open-range industry, based on free use of the grass on the public domain, spread over most of the State. The Montana Stockgrowers Association was organized in 1885. In the winter of 1886–87, the industry was hard hit. Raging blizzards struck the overstocked range, and many ranchers suffered losses of more than 50 percent of their stock.

As homesteaders moved in, some of the ranchers began to acquire title to land. Gradually, the open-range industry gave way to the ranch-cattle industry, even though many ranchers still depend on publicly owned land for grazing. Throughout this period of change, the Montana Stockgrowers Association was active in protecting and advancing the interests of its members and stockgrowers generally.

This reviewer, who grew up on a cattle ranch in central Montana, would have welcomed more information on the 79 Ranch and John T. Murphy, as well as mention of Dan Slayton and Dave Fratt. However, no book can cover all details, and this one has enough to appeal to everyone who has had experience in the State or has an interest in the western livestock industry.

Wayne D. Rasmussen

Agriculture and Urban Growth. By G. P. Wibberley. Michael Joseph, London. (International Publications Service, 18 East 33d Street, New York.) 229 pages. 1959. $5.85.

IN *Agriculture and Urban Growth*, Professor Wibberley leads his reader gently, and almost unconsciously, through the various processes of economic analysis required to establish bases for regional land use planning. His writing style is simple and his examples represent practical problems. Conclusions and recommendations follow logically.

While most of his discussion is oriented specifically to situations in England, Scotland, and Wales, the experiences of other countries are drawn into his analyses. For example, "When the pressures from nonagricultural uses increase in a country, it behooves that country to look more and more carefully and critically at its remaining areas of rural land and to work out techniques for meas-

uring and deciding what to do with that land." (Page 25.) . . . "It is the largest cities that are growing at prodigious speed whether they are in highly or poorly developed countries. The only major difference between cities in the richer economies and those in the poorer is that the former are spilling out at a faster pace and the density of new development is generally much looser." (Page 217.)

Professor Wibberley discusses the economics of the firm, competition for the services of land, methodology for benefit-cost analyses, land values, interest rates on investment, social costs, transfer accounts, and other items that affect the acceptance of decisions on regional land use planning by the public. He believes that choices of sites for future urban growth must be based on logic and knowledge of alternatives if public antipathy to planning is to be overcome.

The chapter titles show the scope of the book: "The Desire for Land;" "The Measurement of Land Uses;" "The National Land-Use Pattern;" "The Physical Effects of Town Growth on Agriculture;" "The Siting of Urban Development on Agricultural Land;" "Food Replacement—At Home or Abroad?" "Food Replacement—In the Domestic Garden;" "New Land—From the Hills?" "New Land—From the Lowlands?" "Agriculture and Sites for New Towns;" "Conclusion: A Comparison with the U.S.A.—The Need for New Methods of Evaluation."

This book helps to explain why the rising number of public land use controls proposed for the United States fails to cure the ills caused by urban growth. Exclusive agricultural zones, lot size limitations, public purchase of development rights, conservation easements, real property tax moratoria in various forms, and numerous other proposals generally have one common weakness—each ignores basic principles of economics. Most require decisions without benefit of factual analysis.

The author, who is head of the Department of Economics at Wye College, University of London, has known intimately the eras of prewar British dependence on imported foods, the wartime struggle to overcome critical shortages, and the postwar economic adjustments in domestic and international affairs. He has observed irresistible urban pressures at work. The old molds of bombed-out cities were no longer acceptable to British urban dwellers. They demanded more space. Social, political, and economic forces clashed head-on in the Town and Country legislation established to guide urban growth. What is the "best" use for a property when land resources are in critically short supply?

Professor Wibberley does not claim that his analysis presents a cure-all. What he tries to do, he asserts, is "to concentrate on those aspects that are still somewhat neglected in land use planning in order to show that by emphasizing the importance of alternatives in land and food policies and the need for cost-benefit analyses, a more rational welding of different interests into a balanced use of the country's land resources can be made." (Page 239.)

Hugh A. Johnson

Economics of Watershed Planning. Edited by George S. Tolley and Fletcher E. Riggs. The Iowa State University Press, Ames. 339 pages. 1961. $3.95.

THE THEORY and practice of resources planning have long interested agricultural economists and public administrators, mainly as areas for learned discussion in numerous books and journals and eventual disagreement. This is disappointing but understandable, for an inclination to agree is not a hallmark of the economic profession. In arranging a Symposium on the Economics of Watershed Planning in Knoxville, Tenn., in 1959, Dr. Tolley and Dr. Riggs recognized that a way out of the methodological wilderness of opposing views was to air them in an open forum, thus reducing polemics to polite questions and thereby to solutions.

In presenting the proceedings of the symposium in book form, the editors demonstrate that complex problems of economic appraisal and institutional organization involved in resource development are solvable with the present "technology" of economic science and the legal arts. But by abstracting at the small watershed level, they have perhaps done more than was hoped.

Economics of Watershed Planning should be regarded as the first useful handbook for comprehensive resources planning, in which it is shown how hydrologic or agronomic data can be interpreted in an input-output context; how marginal analysis can be utilized to formulate optimum

programs for flood control and other water-management purposes in tributary watersheds; and how optimum programs must in turn be interpreted and perhaps modified in the light of legal and organizational restraints.

A full-circle treatment of economic planning problems on a small watershed basis demonstrates that a common conceptual distinction between small watershed and river basin planning is merely a fiction, because river basin planning can be regarded simply as the case where optimum development programs for contained watersheds must be derived simultaneously. This justifies the suggestion by the editors that this volume may be used as a handbook for field technicians, agency specialists, resource administrators, and even academic theorists.

As to its specific value for instructional purposes, *Economics of Watershed Planning* merits serious consideration in both land economics courses at the senior undergraduate level and graduate offerings in research methodology and applied resource economics. Undergraduate students of economics would most clearly benefit from the first four chapters. These chapters set forth the philosophy and objectives of watershed planning; the role of tributary watershed development in the Nation's total resource-development effort; the potential benefits of a concentrated small watershed approach to conservation and water management; and the implications of selecting small watersheds as geographic planning units.

Because of its adequate treatment of the procedural and the data problems actually encountered at the project planning stage, this volume should have considerable appeal to the many physical as well as social scientists involved in watershed planning. Agronomy and engineering majors, of course, will find the introductory chapters useful in perceiving how economists view resource-development problems. More importantly, however, they will recognize in the succeeding sections on data adequacy and interdisciplinary activities that the most crucial aspects of watershed planning involve the form, availability, and reliability of basic hydrologic, soils, or production data.

Following the introductory chapters are contributions that deal with economic appraisal in the more formal sense; these range from budgetary studies of the on-farm aspects of watershed programs to elementary watershed applications of mathematical programing. The discussion then advances to programing methods that consider simultaneously the dynamic aspects of alternative development plans involving the joint influence of land use systems and structural measures in yielding watershed-development benefits. These are clearly the sections most applicable to graduate courses in economics, especially if they are evaluated on a seminar basis.

Despite the most careful collection of basic input-output data and the most rigorous formulation of optimum watershed-development programs, the results of careful economic planning can be negated entirely if the institutional environment within which programs must be implemented is overlooked until plans are complete. Institutional facets of watershed planning are indeed complex; they involve such diverse subjects as cost sharing, financing, organizational problems, and basic water rights. Views of leading authorities on these topics round out the volume and indicate that the editors are not remiss in casting the appraisal and institutional aspects of watershed planning in their proper economic perspective.

The most singular criticism that might be directed toward this compendium is an implied thesis that its value derives chiefly from the urgency of watershed planning problems in the humid East. While it is true that water resources problems are not indigenous to the West, it is unfortunate and unnecessary to attach a regional flavor to a volume that deals so adequately with the conceptual and procedural aspects of watershed planning important in all areas of the country.

George A. Pavelis

World Demand for Paper to 1975. Food and Agriculture Organization of the United Nations. Columbia University Press, New York. 159 pages. 1960. $1.50.

THE STUDY presents a tentative forecast of paper and pulp demand in the various parts of the world and examines possibilities of satisfying needs. The forecast covers the period to 1975.

Selected Recent Research Publications in Agricultural Economics Issued by the United States Department of Agriculture and Cooperatively by the Universities and State Colleges [1]

ANDERSON, K. E. URBAN SCHOOL SYSTEMS WITHOUT LUNCH SERVICE AS A POTENTIAL MARKET FOR FOODS. U.S. Dept. Agr. AMS–443, 8 pp., illus. April 1961.

New lunchrooms in urban school systems now without lunch services are expected to expand food purchases by approximately $2.5 million annually by 1963. Greater availability of school lunch services and the rising school population could result in a market for food in schools approximating $1 billion by 1970 compared with $600 million in 1957–58.

BAILEY, W. R., AND AINES, R. O. HOW WHEAT FARMERS WOULD ADJUST TO DIFFERENT PROGRAMS. U.S. Dept. Agr. Prod. Res. Rpt. 52, 35 pp., illus. 1961.

Six different wheat programs were studied on representative farms in eight specialized wheat-producing areas in the Great Plains and the Pacific Northwest. Program features used include modifications of the present acreage-allotment and price-support program; marketing allotments and stratified wheat prices; and no controls or price support. When acreage allotments are in effect, operators of specialized wheat farms grow the allotted acreages even though wheat prices are supported at prices as low as 65 percent of parity. The best income-producing crop other than wheat are feed grains. Although the income is smaller than that from wheat on most farms, the income from feed grains is important to the specialized wheat farmer when wheat acreage is restricted.

BIRD, KERMIT. AN ANALYSIS OF EGG HANDLING COSTS AND EFFICIENCY. Okla. State Univ. Bul. B–568, 50 pp., illus. November 1960. (Agr. Mktg. Serv. cooperating.)

Presents results of a study of costs and efficiency in plants candling and packing shell eggs. The study is based on observations in existing plants and is directed toward improvements in such plants; it does not attempt to establish maximum efficiency, which would be obtained with newly constructed plants using only the latest equipment.

BIRD, R., AND MILLER, F. PROFITABLE ADJUSTMENTS ON FARMS IN EASTERN OZARKS OF MISSOURI. Mo. Agr. Expt. Sta. Res. Bul. 745, 67 pp., illus. 1960. (Agr. Res. Serv. cooperating.)

In 1955, average net income of all farm households in the Eastern Ozark area was $2,042, of which only $658 came from the farm. Reasons for these low incomes were: (1) Number and type of workers on farms in the area; (2) small size of many farm businesses; and (3) choice of enterprises and levels of efficiency of management. By greater specialization in the most profitable enterprises, farmers could increase net income.

CHUMNEY, W. T., AND VERMEER, J. THE USE AND COST OF TRACTOR POWER AND EQUIPMENT, BY SIZE OF FARM, IN THE CENTRAL COTTON-TOBACCO AREA OF NORTH CAROLINA, 1956. N.C. Agr. Expt. Sta. A.E. Inform. Ser. 82, 47 pp., illus. 1961 (Agr. Res. Serv. cooperating.)

A summary of the cost of owning and operating tractors and tractor equipment on 267 farms selected at random in the central cotton-tobacco area in North Carolina in 1956. Costs of owning and operating tractors and related machinery per unit of use generally were more than twice as high on small farms as on large farms. All farms in the survey, however, were too small to obtain the most efficient use of tractors and related equipment.

CLARK, D. A., JR., AND HERRMANN, L. F. CLASS III MILK IN THE NEW YORK MILKSHED. VI—ECONOMIC ANALYSIS OF CLASS III PRICING. U.S. Dept. Agr. Mktg. Res. Rpt. 466, 52 pp., illus. March 1961.

This is the last report in a group dealing with class III milk pricing in the New York-New Jersey milkshed. It discusses principles of efficient pricing in fluid milk markets under perfect competition, and how these principles might be modified to fit conditions of seasonally fluctuating milk supplies and a system of pricing according to use. It also has a summary of principles advocated by witnesses at hearings on proposals for changes in the New York-New Jersey Milk Marketing Order.

DELOACH, D. B. CHANGES IN FOOD RETAILING—CAUSES, EFFECTS. Wash. Agr. Expt. Sta. Bul. 619, 43 pp. Oct. 1960. (Agr. Mktg. Serv. and Western Regional Tech. Com. cooperating.)

Gradual attrition of unaffiliated, single-unit grocery store firms has been underway since 1939. In 1958, supermarkets and superettes accounted for 92 percent of all grocery store sales. An efficient marketing system should afford farmers some real advantages, if they are able and willing to avail themselves of the opportunities. Small farmers could correct some of the disadvantage of dealing with large buyers by cooperative marketing.

ESMAY, J. L. EFFICIENT RESOURCE COMBINATIONS ON DRYLAND FARMS IN SOUTHEASTERN IDAHO. Idaho Agr. Expt. Sta. Bul. 355, 22 pp., illus. 1961. (Agr. Res. Serv. cooperating.)

Three representative farm budgets based on present practices, yields, and sizes and performance rates of tractors and equipment illustrate the importance of combining machinery, land, and labor to yield the lowest average total costs. Adjustments to reduce costs on farms with acreages below or between the representative farm sizes are: (1) Keep farm at present size and make no changes in amounts of equipment and labor used in operation; (2) make more efficient use of labor and machinery resources by doing custom work for other farmers; (3) increase crop acreage by purchase or rental; (4) decrease cropland by selling or renting out part of the farm and reducing equipment inventory to fit the needs of the reduced farm size. Hire some farmwork done on a custom basis if customwork is available.

FELLOWS, I. F., ED. BUDGETING. TOOL OF RESEARCH AND EXTENSION IN AGRICULTURAL ECONOMICS. Storrs (Conn.) Agr. Expt. Sta. Bul. 357, 45 pp., illus. 1960. (Agr. Res. Serv. cooperating.)

[1] State publications may be obtained from the issuing agencies of the respective States.

The papers presented in this report cover five broad areas of budgeting: Basic theory and assumptions; sources of input-output data; sources of price data; typical problems in budgeting; and research and extension use.

GALE, H. F. SEASONAL VARIATION IN FARM FOOD PRICES AND PRICE SPREADS. U.S. Dept. Agr. Misc. Pub. 840, 47 pp., illus. Jan. 1961.

Of the major groups of foods studied during a 12-year period, fruits and vegetables showed the widest seasonal swings, dairy products the smallest; meats and poultry products were intermediate between the other groups. For most commodities seasonal and irregular factors were found to be the most important of the four major causes of price changes. Swings in farm value were larger, on a percentage basis, than changes in retail prices and marketing charges. In dollars per unit of food, changes in retail prices usually were the larger.

GAVETT, E. E. TRUCK CROP PRODUCTION PRACTICES, COLUMBIA COUNTY, WISCONSIN, LABOR, POWER, AND MATERIALS BY OPERATION. U.S. Agr. Res. Serv. ARS 43–132, 16 pp., illus. 1961.

Columbia County is one of the more important vegetable-producing counties in the State. In general, the farms in the area specialize in production of one truck crop. Green peas and sweet corn were the major truck crops grown. Tractors were the main source of power. For sweet corn and green peas for processing, most of the acreage was harvested by processors and local custom operators.

HANES, J. K. MARKETING MARGINS FOR FALL POTATOES. U.S. Dept. Agr. Mktg. Res. Rpt. 450, 24 pp., illus.

The marketing margin was higher for Idaho Burbank Russet potatoes than for other varieties of fall potatoes sold in 4 cities during a test period. Differences in wage rates, operating efficiency, cost of goods and services, and profits cause differences in the margin. Prices of four other varieties were also studied: At Atlanta, Round White potatoes from the Northeast; Chicago, Pontiac potatoes from North Dakota-Minnesota; Los Angeles, California Long Whites; New York, potatoes of the Katahdin-Chippewa type from Long Island and Maine.

HENDERSON, P. L., AND BROWN, S. E. EFFECTIVENESS OF A SPECIAL PROMOTIONAL CAMPAIGN FOR FROZEN CONCENTRATED ORANGE JUICE. U.S. Dept. Agr. Mktg. Res. Rpt. 457, 15 pp., illus. March 1961.

A $4-million nationwide promotional campaign for frozen orange concentrate increased sales sufficiently to bring the industry an estimated additional $18 million in gross income which it probably would not have received otherwise. From September 1959 through March 1960, dollar sales were 13 percent above the level that normally would be expected at the prevailing prices. Study shows that the sales increases were obtained from two sources: Both the percentage of families buying the product and the average size of family purchase increased, compared with periods of no promotion.

HERRMANN, L. F., AGNEW, D. B., AND CLARKE, D. A., JR. CLASS III MILK IN THE NEW YORK MILKSHED. V—PROCESSORS' DECISIONS ON UTILIZATION. U.S. Dept. Agr. Mktg. Res. Rpt. 462, 28 pp. March 1961.

This report is one of a group dealing with class III milk pricing in the New York-New Jersey milkshed. It deals with the extent to which changes in output of the major products of class III milk were associated with change in margins for these products in the 5 or 10 years ending with 1957. It also gives results of interviews with officials of many of the firms that handled class III milk. These officials were asked what considerations affected their decisions on how they use class III milk.

JONES, T. L., AND MILLER, F. NATURE AND EXTENT OF IRRIGATION IN MISSOURI. Mo. Agr. Expt. Sta. Res. Bul. 735, 44 pp., illus. 1960. (Agr. Res. Serv. cooperating.)

Most of the expansion in irrigation of field crops in Missouri has come since 1950. Field crops irrigated were corn, cotton, pasture and hay, grain sorghum, and small grain. Vegetables, orchards, nursery stock, flowers, strawberries, and tobacco were the specialty crops irrigated. From 1954 to 1958, corn was the major crop irrigated in terms of total number of acres irrigated; pasture and hay second; cotton third; and vegetable crops fourth. Vegetables were the only crops for which the total number of acres irrigated increased each year during the 5-year period.

KOTTKE, M., MCALEXANDER, R., RORHOLM, N., AND STANTON, B. F. EVALUATING THE PROFITABILITY OF IRRIGATION ON NORTHEASTERN DAIRY FARMS. N.H. Agr. Expt. Sta. Bul. 469, 26 pp. 1960. (Northeast Regional Publication.) (Agr. Res. Serv. cooperating.)

Before buying an irrigation system, a dairyman must consider: (1) Capital investment and costs of operating typical irrigation systems; (2) kinds of increases in yields that may result over a period of years from irrigation; (3) how irrigation compares with other methods of providing more forage for more milking cows. Feeding green chop; buying replacement heifers instead of raising them; applying a higher level of fertilizer; replacing corn grain with corn silage; buying additional hay, renting additional hay and pastureland; and feeding additional grain to replace forage can help the farmer increase the size of his operation, as can irrigation. In evaluating several production alternatives, the farmer will base his final decision on the profitability prospects, on his capital and labor situation, and on the amount of risk he is willing to take.

KRENZ, R. D., HEADY, E. O., AND BAUMANN, R. V. PROFIT-MAXIMIZING PLANS AND STATIC SUPPLY SCHEDULES FOR FLUID MILK IN THE DES MOINES MILKSHED. Iowa Agr. and Home Econ. Expt. Sta. Res. Bul. 486, pp. [931]–951, illus. 1960. (Agr. Res. Serv. cooperating.)

Dairy farms in the area were classified into 24 categories on the basis of acreage, soil type, tenure, and dairy-building resources. Optimum plans were developed for

an average farm in each category at two levels of production per cow. Plans were developed for short-run and two long-run planning periods. In the first, buildings and supply of operating capital are considered fixed at about current levels; in the latter, buildings are considered variable, and operating capital is limited only by the requirement that it earn at least a 5-percent return on investments. In the short-run plans, dairy expansion is limited by building space. In the long-run plans, fall labor and forage become limiting factors.

LIFQUIST, ROSALIND C. EXPENDITURES FOR PROCESSED FOODS BY EMPLOYEE FOOD SERVICES IN MANUFACTURING PLANTS. U.S. Dept. Agr. Mktg. Res. Rpt. 458, 54 pp., illus. March 1961.

This is the third report dealing with employee food services in manufacturing plants with 250 or more persons on their payrolls. This report presents the major findings on the form in which foods were purchased. It gives special attention to expenditures for services provided by marketing agencies that reduce the amount of kitchen preparation of food required by these institutional consumers.

MACPHERSON, D. D., AND MALDONADO, JESÚS L. COSTS, NET MARGINS, AND SELLING PRICES OF BEVERAGES SOLD IN AN EMPLOYEE FOOD SERVICE. U.S. Dept. Agr. Mktg. Res. Rpt. 464, 27 pp., illus. April 1961.

Describes the relation of costs and margins to prices for beverages in a cafeteria operated for employees in an office building in Washington, D.C. During a 2-week period, 56 percent of the 106,000 beverage sales were coffee, 17 percent tea, 14 percent milk, and 13 percent other beverages. Major components of beverage cost were 40 percent for raw materials, 37 percent for labor, 18 percent for containers, and 5 percent other.

MARTIN, J. R., AND SOUTHERN, J. H. PART-TIME FARMING IN NORTHEAST TEXAS. Tex. Agr. Expt. Sta. Bul. 970, 23 pp., illus. 1961. (Agr. Res. Serv. cooperating.)

A major farm adjustment in the area has been an increase in part-time farming, or greater dependence on nonfarm sources of income by farm families. Part-time operators controlled 40 percent of the farm and land resources, marketed 28 percent of all farm products sold, but received only 16 percent of the net money return from farming in the area. Major economic employment activity reported by part-time farm operators was wage or salary work. Returns to family labor in off-farm work were much higher than returns to family labor from farming.

PINE, W. H. LAND OWNERSHIP IN KANSAS, 1958. Kans. Agr. Expt. Sta. Bul. 430, 24 pp., illus. 1961. (Agr. Res. Serv. cooperating.)

Kansas consists of 52½ million acres, of which all except 1 million acres is in farms and ranches. About half the owners are active farmers. Many other owners are retired farmers or have had some farm experience. A third of the owners farm none of their lands. A third of all owners have two or more farms. Concentration of ownership has increased slightly since 1945. Except for North Dakota, the concentration in Kansas is less than in other Great Plains States.

STEWART, C. E. ECONOMIC PROBLEMS OF IRRIGATION DEVELOPMENT IN ESTABLISHED DRYLAND FARMING AREAS: LOWER MARIAS, MONTANA. Mont. Agr. Expt. Sta. Res. Rpt. 14, 70 pp., illus. 1961. (Mimeographed.) (Agr. Res. Serv. cooperating.)

Accelerated development of irrigated farms is desirable over the customary slow development. Increased incomes, more adequate public services, and a resource base for credit programs are among the advantages. Accelerated development is further supported by the apparent efficiencies of (1) greater use of technical knowledge and large-scale equipment, (2) release of the managerial resources of farmers for farm production, and (3) early use and productivity of irrigation water supplies. However, most settlers do not have sufficient resources or access to enough credit to develop land and acquire buildings for a fully irrigated farm within 1 or 2 years. This is a main point of emphasis in the study.

STIPPLER, H. H., AND CASTLE, E. N. WHEAT FARMING IN THE COLUMBIA BASIN OF OREGON. PART 1. MAJOR CHARACTERISTICS OF AGRICULTURE. Oreg. Agr. Expt. Sta. Sta. Bul. 577, 23 pp., illus. 1961. (Agr. Res. Serv. cooperating.)

Cash grain farming with or without range livestock remains the major type of agriculture in the wheat area. Barley production has become important only since initiation of the acreage allotment program, as an alternative crop on land diverted from wheat. New technology in farming, mainly improved practices, weed control, fertilization, and better varieties have contributed to rapidly rising yields. In the face of rising costs without substantial price increases for wheat and barley, the acreage-allotment program has permitted some wheat farmers, who were able to enlarge the size of their operations, to maintain satisfactory incomes.

STIPPLER, H. H., AND CASTLE, E. N. WHEAT FARMING IN THE COLUMBIA BASIN OF OREGON. PART 2. COSTS AND RETURNS ON SPECIALIZED WHEAT SUMMER-FALLOW FARMS. Oreg. Agr. Expt. Sta. Sta. Bul. 578, 22 pp., illus. 1961. (Agr. Res. Serv. cooperating.)

Presents income and expense data on specialized wheat summer-fallow farms with respect to (1) tillage practices; (2) farm sizes; (3) productivity levels; and (4) product prices. Budgets for moldboard plow and stubble mulch fallow operations are included. Gross farm income increases for the moldboard-fallow operation at a constant rate as acreage of cropland increases. Budgets for the stubble mulch fallow farms show income and cost relationships similar to those for the moldboard fallow farms.

U.S. AGRICULTURAL MARKETING SERVICE. FOOD COSTS. RETAIL PRICES; FARM PRICES; MARKETING SPREADS. U.S. Dept. Agr. Misc. Pub. 856, 16 pp., illus. April 1961.

Retail prices of food have risen less than most other items in the consumer's budget. In 1960, retail food prices were about a sixth higher than their 1947–49 average, but

the Consumer Price Index rose more than a fourth. The total bill for marketing food has more than quadrupled in the last 20 years.

VOSLOH, C. J., JR. LABOR AND CAPITAL FOR PELLETING FORMULA FEEDS. U.S. Dept. Agr. Mktg. Res. Rpt. 463, 22 pp., illus.

Describes pelleting costs and income in mixed-feed mills with an annual capacity of about 12,000 tons and discusses initial investment, equipment required, depreciation, interest, and labor costs for two model pelleting systems.

Statistical Compilations

BUTLER, C. P., AND BURCH, T. A. PRODUCTION REQUIREMENTS AND ESTIMATED RETURNS FROM SELECTED CROP AND LIVESTOCK ENTERPRISES IN THE PIEDMONT AREA OF SOUTH CAROLINA. S.C. Agr. Expt. Sta. AE 202, 133 pp. 1960. (Mimeographed.) (Agr. Res. Serv. cooperating.)

CONNOR, L. J., LAGRONE, W. F., AND PLAXICO, J. S. RESOURCE REQUIREMENTS, COSTS, AND EXPECTED RETURNS; ALTERNATIVE CROP AND LIVESTOCK ENTERPRISES; LOAM SOILS OF THE ROLLING PLAINS OF SOUTHWESTERN OKLAHOMA. Okla. Agr. Expt. Sta. Processed Ser. P–368, 59 pp., illus., 1961. (Mimeographed.) (Agr. Res. Serv. cooperating.)

ELLIS, T. H., AND PARTENHEIMER, E. J. COSTS AND RETURNS FROM LIVESTOCK PRODUCTION IN THE LIMESTONE VALLEY AREAS OF ALABAMA. Ala. Agr. Expt. Sta. Mimeo. Rpt., [83 pp.], illus. 1960. (Agr. Res. Serv. cooperating.)

LAGRONE, W. F., STRICKLAND, P. L., JR., AND PLAXICO, J. S. RESOURCE REQUIREMENTS, COSTS, AND EXPECTED RETURNS; ALTERNATIVE CROP AND LIVESTOCK ENTERPRISES: SANDY SOILS OF THE ROLLING PLAINS OF SOUTHWESTERN OKLAHOMA. Okla. Agr. Expt. Sta. Process Ser. P–369, 55 pp., illus. 1961. (Mimeographed.) (Agr. Res. Serv. cooperating.)

PARSONS, M . S. FARM MACHINERY: A SURVEY OF OWNERSHIP AND CUSTOM WORK. U.S. Dept. Agr. Statis. Bul. 279, 26 pp. 1961.

TEXAS AGRICULTURAL EXPERIMENT STATION. PRODUCTION COSTS AND EXPECTED RETURNS; ALTERNATIVE CROP AND LIVESTOCK ENTERPRISES; CLAY SOILS IN THE NORTHERN PORTION OF THE ROLLING PLAINS OF TEXAS. Tex. Agr. Expt. Sta. MP–445, 54 pp., illus. 1960. (Mimeographed.) (Agr. Res. Serv. cooperating.)

THORFINNSON, T. S., AND EPP, A. W. COST AND PERFORMANCE OF SELECTED HARVESTING MACHINES IN NEBRASKA. Nebr. Agr. Expt. Sta. Dept. Agr. Econ. Rpt. 19, 24 pp., illus. [1961.] (Mimeographed.) (Agr. Res. Serv. cooperating.)

Contributors

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